THE
MARY IMOGENE BASSETT HOSPITAL
LIBRARY

Presented By

Thomas A. Farrell, M.D. 1976

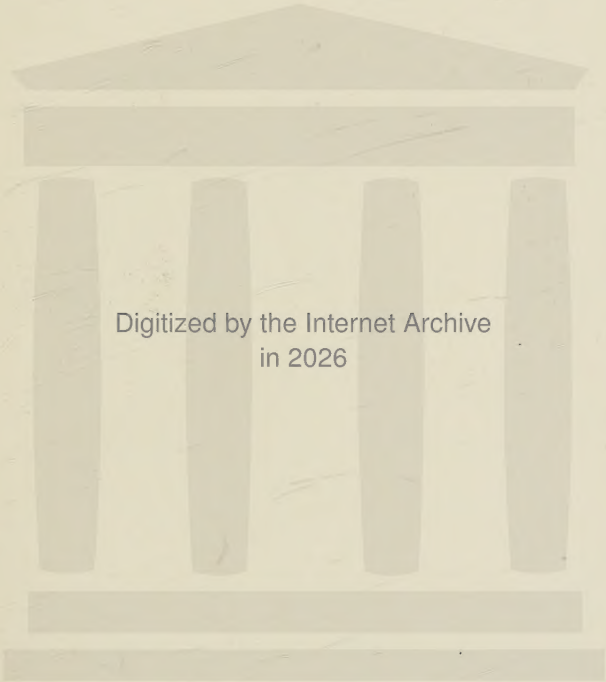
SERIAL

MEDICAL LIBRARY
The
Mary Imogene Bassett Hospital
COOPERSTOWN, N. Y. 13326
Title Eye, ear, nose and throat
Vol. 1926
Access. No. 23664

Mary Imogene Bassett Hospital Library

76968

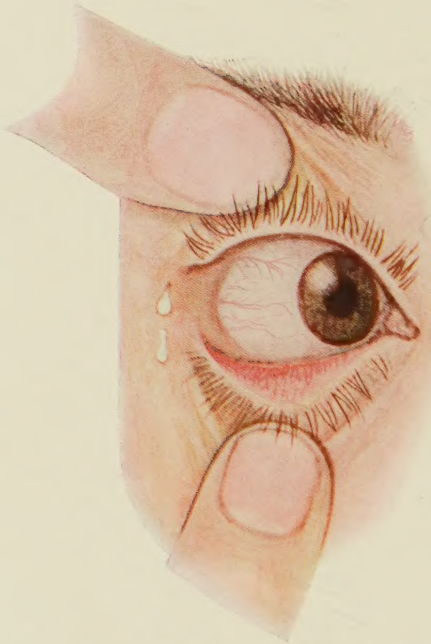
20



Digitized by the Internet Archive
in 2026

https://archive.org/details/practicalmedicin0000unse_x1l8

PLATE I.



Anomaly of external canthus and duct of lacrimal gland.—W. P. Ling. *(Amer. Jour. Ophth.)*

The

Practical Medicine Series

COMPRISING EIGHT VOLUMES ON THE YEAR'S PROGRESS IN MEDICINE AND SURGERY

Under the General Editorial Charge of

CHARLES L. MIX, A.M., M.D.

The Eye, Ear, Nose and Throat

EDITED BY

CHARLES P. SMALL, M.D.
ALBERT H. ANDREWS, M.D.
GEORGE E. SHAMBAUGH, M.D.

SERIES 1926

CHICAGO
THE YEAR BOOK PUBLISHERS
304 South Dearborn Street

COPYRIGHT 1926
BY
THE YEAR BOOK PUBLISHERS

DEPARTMENTS

The Eye

CHARLES P. SMALL, M.D.

Instructor in Ophthalmology, Chicago Policlinic; Collaborator, American Encyclopedia of Ophthalmology; Ex-President, Chicago Ophthalmological Society

The Ear

ALBERT H. ANDREWS, M.D.

Professor of Otology, Rhinology and Laryngology in the Chicago Policlinic Oculist and Aurist to the Chicago, Rock Island & Pacific Railway, etc.

The Nose and Throat

GEORGE E. SHAMBAUGH, M.D.

Professor of Otology, Rhinology and Laryngology, Rush Medical College of the University of Chicago; Otologist of the Presbyterian Hospital

Mary Imogene Bassett Hospital Library
23664

General Considerations 331
Diseases of the Nose 348
Nasal Deformity 348
The Nasal Accessory Sinuses 358
The Miscellaneous Nasal Conditions 383
Diseases of the Mouth 395
Diseases of the Throat 407
The Tonsils 407
Pemphigus 429
The Pharynx 433
Diseases of the Larynx and Trachea 446
Voice and Speech Disorders 473
Bronchoscopy and Esophagoscopy 487

THE EYE

Recent Advances in Ophthalmology

During the past year probably more has been written upon the contribution of the slit-lamp to our knowledge of the anatomy, diagnosis, pathology and prognosis of ocular diseases than upon any other subject. H. W. Reid[1] recounts some of the newly discovered conditions by this method of examination. In the vessels of the limbus, the circulation is easily recognized. The superficial lymph vessels can be seen after staining with methylene blue. The corneal nerve fibers show their medulated sheath at the limbus. The iris appears with its many patterns, colorations and pigment designs. Within the lens we are able to see the lamellar and nuclear layers with their characteristic suture markings and surface contour. The posterior capsule of the lens bears evidence throughout life of the remnants of embryonic vascular activity. In cases of keratoconus it is possible to make an early diagnosis, by observing the thickening of the nerve fibers, a changed surface reflection of the endothelium in the back of the cornea, the stippling of the deep stroma, as well as the characteristic hemosiderin ring. Corneal nebulae and maculae have been studied in detail. The study of depigmentation in the anterior chamber has opened a new chapter in ocular research. Tuberculosis of the iris can be followed from its very early stages to complete development and to possible recovery. Proliferative processes in the growing tubercle can easily be distinguished from the exudative ones for the former bring about the formation of more or less pronounced tubercles while the latter lead to opacities in the aqueous humor. In the field of tuber-

(1) Cincin. J. Med., December, 1925.

culosis no organ is so well adapted to show the intimate relation between the cutaneous phenomenon and endogenous causes, as is the eye, with its delicate conjunctivae and transparent cornea. The theory now generally held by ophthalmologists, that the chief representative of the scrofulous eruptions, the phlyctenula, is the result of increased sensitiveness to the endotoxine of the tubercle bacillus.

Incipient uveal pathology may be diagnosed by evidence of fluid in an otherwise clear vitreous, as well as by the very beginning of complicata cataracta under the posterior capsule. In the lens the various forms of cataract can now be better interpreted.

A study of Parinaud's conjunctivitis has shown that the tubercle bacillus of rodents may be dangerous to humans. The latest discoveries in the field of herpes febrilis also are closely related to ophthalmology. The results of several research workers have demonstrated that it is not a neurotrophic disturbance but an infectious disease that can be inoculated upon the rabbit's cornea. That the organisms are found in the fresh lesions of herpes labialis and not in the cutaneous lesions of herpes zoster and that the latter must be of different origin.

Ophthalmology also aids in explaining the disturbances that result from diseases of metabolism. Albuminuric retinitis is no longer regarded as an elaboration of albuminuria, it is now known that the retinal disturbance is only a manifestation of hypertonia which need not be even of renal origin. In diabetic retinitis the rise of blood pressure interposes as an etiological factor between the diabetes and the retinitis. Many cases of cataract have as their etiological factor a high concentration of blood sugar when the urine sugar is normal.

Finally the phenomena of choked disk has been definitely separated from the picture of optic neuritis. Choked disk is produced only by physical factors.

Though there is still room for discussion of the finer mechanism which acts as an intermediary between cerebral pressure and swelling of the head of the optic nerve, there is at present, accord as to the essential significance of the phenomenon.

There has been a tendency during the past year for many ophthalmologists to return to the classical operation for cataract. A great deal of enthusiasm of the intracapsular extraction has died as final results were published. Yet there are many cases where this is the operation of choice. Likewise intranasal operations for the cure or relief of optic neuritis, in spite of an occasional brilliant result, are on the downward swing of the pendulum.

Chronic simple glaucoma continues to be the thief in the night and many of these unfortunate blind people have been victims of optometrists who for years have changed their glasses every few months trying to cure a condition that they did not and could not recognize.

Congenital Anomalies

Anomalous Duct of Lacrimal Gland. The diagnosis of congenital anomalies, as Jackson says, is valuable in itself, even if they cannot be treated; and exclusion of such conditions is an extremely important step in the diagnosis of diseases that can be treated.

W. P. Ling[2] reports an interesting and very unusual congenital anomaly in a sixteen year old Chinese boy who came to the eye clinic of the Peking Union Medical College Hospital on account of a constant dripping of fluid from a small opening on the skin close to the external canthus of his right eye, which he had since birth. He gave no history of injury or of inflammatory symptoms referred to that region. The fluid caused no irritation of the surrounding skin. He complained

(2) Am. J. Ophth., January, 1926.

of no dry sensation in his eyes nor of imperfect vision. His family and past histories are unimportant.

Examination.—The patient is physically underdeveloped for one of his age. His face is noticeably asymmetric, the left side being longer than the right. In front of his right ear, close to the tragus, he has two pedunculated globular masses about the size of large grapes.

Vision of both eyes is 6/10. When the eyelids of the right eye are drawn apart at the region of the external canthus, it is found that their ends do not meet so as to form an acute angle, but instead they are separated from each other by a space of about five millimeters. They merge almost imperceptably into a semilunar fold of skin which covers the eyeball adjacent to the malformed canthus. This fold of skin is continuous on one side of the skin of the face, on the other side with the palpebral and bulbar conjunctiva. Its inner edge is curved and concentric with the margin of the cornea. It measures about 12 mm. wide including the parts reflected toward the culdesacs. It merges almost imperceptibly from skin into mucous membrane. From under the fold several large blood vessels are seen running horizontally toward the cornea. (Frontispiece, Plate I.)

Immediately external to the malformed canthus there is an oblique opening in the skin measuring one millimeter in diameter from which a transparent fluid is dripping. Pressure on or manipulation of the part causes no pain. Into the opening a small probe can readily be passed upward toward the lacrimal gland for a distance of eight millimeters without producing any bleeding.

There are no other anomalies of the eye. The left eye is normal. The fundi are normal.

A portion of the duct about 10 mm. long was excised under infiltration anesthesia. It was found to be connected with the orbital portion of the lacrimal

gland. The wound healed by first intention, and complete cure followed.

Microscopically, the duct is seen to be lined by stratified squamous epithelium. Around the lumen there are several hair follicles, sebaceous glands, and a few sweat glands. The framework is composed of connective tissue.

An Ocular Malformation in a Woman and Her Eight Year Old Daughter. C. F. Ashby[3] reports that in both were found: (1) Both corneae were almond-shaped, with the long axis placed vertically. (2) The pupils were pear-shaped, apex downwards, situated eccentrically in the lower nasal quadrant of the cornea. The

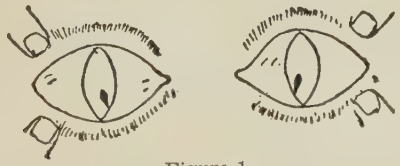


Figure 1.

apex was at the periphery of the cornea at 7 o'clock in the left eye, 5 o'clock in the right. The rest of the pupil lay along a line from this point towards the midpoint of the cornea, and extended about two-thirds of this distance. They were equal on each side. (3) They did not react to light stimulus, either direct or consensual. (4) They reacted slightly and slowly with convergence (only noted in the mother's case). (5) They dilated well with mydriatics, retaining their pear shape. Vision was good, except in the case of the child's left eye, where it was somewhat impaired by a few small white opacities in the lens. Ophthalmoscopic examination revealed normal disks. The child's eyes were in a state of constant lateral nystagmus. Its intelligence seemed average.

No history or evidence of syphilis was obtained in

(3) Brit. M. J., June 5, 1926.

the mother's case, and none of her children showed any of the usual stigmata of the congenital variety.

Examination of the Eye

The Value of a Routine Examination of the Eyes in a General Diagnostic Clinic. The relation of the ophthalmologist to general medicine is well known, but the importance of a routine eye examination has been undervalued.

The value of the ophthalmologist in relieving headaches due to eye strain by the proper correction of errors of refaction with glasses, or other measures is now universally known to the lay public almost as well as to the profession. Now most sufferers of headaches come to us of their own accord, but we should prefer to have our confreres refer such patients to us accompanied with the report that they find nothing in their general condition to account for the headaches. Then our percentage of cures would be higher, and the interdependence of the various branches of medicine would be more satisfactory. As it is now, we are sending patients back to their own physicians because there are some other factors producing the headaches, which require attention at the same time as the eye. Often these may be the sole cause of the ailment and the eyes themselves are not at fault.

The aid that the ophthalmologist can give is not limited alone to diagnosis, but also in checking up with the treatment and progress of systemic diseases.

M. F. Meyer[4] gives a brief summary of the systemic conditions most frequently seen, where an ophthalmoscopic examination of the eye may be of valuable aid in diagnosis.

All patients with cardiovascular renal disease, arterial hypertension, nephritis, diabetes, diseases of the blood, of the skin, tuberculosis and pregnancy should

(4) New Orleans M. & S. J., November, 1925.

have as a part of their routine examination a careful eye examination, both external and ophthalmoscopic by ophthalmologists, who know the detailed findings of other examiners.

It is often that in the eye first of all we note evidences of arteriosclerosis, nephritis, tuberculosis, diabetes, syphilis, cerebral neoplasms and grave nerve disorders.

We know that the eye is the only organ in the body with transparent tissues, and through these we may see the blood coursing through the blood vessels, thereby disclosing the secret processes of disease and repair. With the advent of the Gullstrand slit-lamp and corneal microscope, a new field is opened for the ophthalmologist, and the time is not so distant when from changes in the eye alone we will be able to diagnose many diseases before there are signs and symptoms in other parts of the body. Many of these changes in the tissues of the eyes cannot be grossly demonstrated but can only be seen with intense illumination and high magnification. This is exemplified in the diagnosis of tuberculosis in the eye which has to be accepted by clinicians because of later findings in the lungs.

The optic nerve is the largest one of the cranial nerves, but is so short that it is often spoken of an offshoot of the brain. It ends in the posterior part of the eye and may be seen on end as a flat, rounded, white disk. Here is the barometer that may register the degrees and fluctuation of intracranial pressure, due to tumor or abscess, meningitis or other inflammations, or in increased pressure that follows often after fracture of the skull. Every injury to the head should be followed by an ophthalmoscopic examination, even if vision is apparently not affected.

The eye itself is seldom the primary seat of disease (except in glaucoma, malignancy, injury and a few others) but is the effect of cause or causes that derange

the human economy and find expression in the eyes. Thus, it is in examining various parts of the eye that we are able to give to the other examiners clues which are of value in making a diagnosis. It is also true that if we attempt to treat the eye independently we will fail.

Chronic blepharitis or disease of the margins of the lids is a condition of the patient that is often indicative of malnutrition, lack of vitamins, endocrine disturbances or improper hygienic surroundings. This is also true in many of the chronic conjunctival conditions, especially in phylyctenular disease which is often associated with tuberculosis, improper hygienic and dietetic conditions.

The common disturbances of the cornea are: phylyctenular disease in children, interstitial keratitis always due to lues, hereditary as a rule, trophic ulcerations in adults due to run down conditions or endocrine disorders.

From the disturbances of motility of the eyes, either as an apparent or real squint, or from diplopia we can help in the diagnosis of encephalitis lethargica, lues, fracture of the skull or sequellae or infectious diseases as diphtheria.

From Argyl Robertson pupil which reacts to accommodation and convergence but not to light, we may diagnose tabes dorsalis or early general paresis. Then there are also other pupillary reactions which may help in the diagnosis of psycho-neurotic conditions.

From scars or other lesions in the iris we may diagnose lues, tuberculosis, leprosy, gonorrhea, rheumatism focal infection, and malformations, both congenital and stigmatic.

In the ciliary body we have very much the same lesions on account of the contiguity of the tissue, but we see in addition products cast off into the anterior chamber and on the posterior surface of the cornea as deposits.

[With the aid of the gonioscope, recently devised by Troncoso, we are able to study the ciliary body itself in a manner previously impossible.—Ed.]

The lens as the seat of cataracts, senile or pathophytologic etiology as yet unknown, congenital cataracts in children, pathologic due to lues, diabetic or unclassified.

In the vitreous we find opacities which are products of diseases of the posterior part of the eye, as the choroid, and it is with the new slit-lamp that we are beginning to study and classify them.

The choroid and the retina may be considered together for it is in the fundus that the lesions are noted by means of the ophthalmoscope. From a swollen or choked disk we can often diagnose cerebral tumors or other inflammations; from retro-bulbar optic neuritis, sinus disease; from an atrophic disk, lues and from an excavated disk, glaucoma.

The blood vessels of the fundus are next examined. The arteries are narrowed, or enlarged, hemorrhages of all types, a diagnosis of arteriosclerosis can be made. Various blood dyscrasias can likewise be discerned.

The fundus proper is the seat of numerous inflammations and exudations and from these lesions we may diagnose the following conditions: Arteriosclerosis, which is the most commonly found disease of all; lues, which have myriads of lesions in both retina and choroid; focal infections; retinitis albumenuria of pregnancy or nephritis; retinitis of diabetes, and retinitis of pigmentary degeneration.

In addition to the actual finding of the lesions found in the different parts of the eye, the vision and fields of vision must be considered as essential components in making a diagnosis. This is particularly true in diagnosis of cerebral tumors, where the fields are just as important as the disk itself.

Medical Ophthalmoscopy. To every man who is

earnestly endeavoring to increase his knowledge of the ways and means of diagnosing disease, there comes a time when he must look back to the foundations of the structures he is building.

The invention of instruments of precision, particularly of optical instruments, together with the adoption of discoveries in physiologic optics, has opened new fields. The trails blazed in these new lands by pioneers become paths to be used by increasing hundreds of travelers and students, and views are described from points of vantage along these trails. After a time, it becomes necessary to rechart such territory and often to readjust conceptions. The ground must be gone over with improved instruments, and closer observations made and data carefully collected and checked against data previously gathered.

From the standpoint of present-day investigations into the course of disease, W. L. Benedict[5] looks back to the foundation of one of the most useful means of observation that has been introduced into the science of medicine, that of ophthalmoscopy, and to view its present structure from the bottom up. The whole of the medical profession united in February of this year in regretting the passing of Sir Clifford Allbutt, who died at the advanced age of eighty-eight. He was the acknowledged leader of the profession in his country and had attained to this position by outstanding clinical experience, by an unrivalled knowledge of the literary side of our science and by his wonderful ability to deal with men and things.

As has so often happened with important discoveries and inventions, Helmholtz' contrivance of an Augenspiegel with which to inspect the interior of the eye, first described in a monograph published in Berlin in December, 1851, seems to have been but the logical outcome of a series of interesting observations made by a number of investigators in the field of physiologic

(5) Minnesota Med., May, 1926.

optics. But oddly enough, the problem which these investigators, with the exception of Cumming, were endeavoring to solve, and which Helmholtz had in mind, was not the discovery of a means by which the background of the eye could be inspected and pathologic changes situated there recognized, but a solution of the question why, under usual conditions, the pupil of the eye appears black and seems to emit no light, while, under certain unusual conditions, it does emit light and assumes a reddish appearance.

As Helmholtz' first instrument was merely a sheet or sheets of plain glass set at an angle in a pasteboard box, it was difficult to use. He himself later said of it, "It was at first so difficult to use that I doubt if I should have persevered unless I had felt that it must succeed; but in eight days I had the great joy of being the first who saw before him a living human retina."

Among the first to appreciate the true importance of Helmholtz's invention and to acquire facility in its use were Von Graefe, to whom Helmholtz sent one of his earliest instruments; Liebreich, who was an assistant of Helmholtz at the time the ophthalmoscope was invented; Donders and Jaeger, Desmarres, Bowman and Hulke. Williams of Cincinnati (1854) spoke of the ophthalmoscope in terms of highest commendation and was the first to introduce the new instrument to the knowledge of the medical profession in this country. In answer to the question, "What has the ophthalmoscope done for ophthalmology?" perhaps a more comprehensive answer cannot be given than to say that it has done all that Helmholtz promised it would do. His prediction was that it would show alterations in the retina just as the unaided eye saw them in the cornea and iris; that it would enable us to detect congestion of the retinal vessels and inflammatory exudations on or in the retina or between it and the choroid; that it would permit us to recognize more

easily and certainly the presence of high degrees of opacities of the crystalline lens and that by its aid we should be able to detect the exactness or measure the amount of farsightedness or nearsightedness; and, in short, all that dissection had shown in the dead eye it would enable us to recognize in the living one. A more striking example of prediction than his, it would be difficult to find. But ophthalmology is not the only department of medicine that is beholden to the ophthalmoscope. The specialist in diseases of the eye had hardly learned to appreciate its value before his brethren interested in affections of the brain and the nervous system began to realize how great a boon it was to them as well. Von Graefe and Sichel were among the first to recognize and point out the close relationship existing between optic neuritis and cranial diseases. Hughlings Jackson in London and Clifford Allbutt in Leeds profited by their suggestions, and were the first to approach the subject from the standpoint of the neurologist. These two men may well be called the fathers of medical ophthalmoscopy.

Within twenty years then from the time the first crude ophthalmoscopes were introduced, the foundations of our knowledge of ophthalmoscopy were laid and the relationships between the visible changes in the fundus of the living eye and the constitutional disturbances were established. The first ophthalmoscopes were used for viewing the fundus by the indirect method. The image of the retina was small and the optic nerve the most prominent feature of the fundus. It is quite natural that the first definite relationships should be established about the visible changes in the optic nerve, and both Allbutt and Gowers because of their interest in neurology were quick to recognize the advantage of ophthalmoscopic examination. On one occasion, Allbutt reported on the importance of ophthalmoscopic examination as an aid in the diagnosis of tuberculous meningitis. It was his opinion that the

disks were red and inflamed as a result of the extension of the inflammation along the dural sheath at the base of the brain, and that the optic nerve showed with the ophthalmoscope what one would expect to find at necropsy as a result of continued irritation without increased intercranial pressure. In this same article he recognized the infrequency with which tubercles of the choroid may be seen and stated clearly that he would not expect to find tubercles in the fundus in a case of tuberculous meningitis.

Early in his carrer, Allbutt was interested in diseases of the kidneys. He was one of the first to recognize and to describe changes in the fundus accompanied by diseases of the kidneys, and he has described at length changes resulting from nephritis in disease of the cardiovascular system. Allbutt's active participation in ophthalmology waned somewhat in the latter half of his active work. As the instrument became more generally used in the ophthalmic hospitals, he quoted more and more frequently from ophthalmic surgeons than from his own observations. While he did not describe the changes in the fundus that we now recognize as characteristic of certain diseases of the circulatory system, he paved the way for investigation of these diseases by his masterly work on diseases of the circulation in general, particularly on diseases accompanied by high blood pressure. In recent years, there have been described as clinical entities retinitis of arteriosclerosis of the type mentioned by Allbutt as atherosclerosis, the retinitis of nephritis, retinitis of hypertension (hyperpiesia), and the retinitis of malignant hypertension. These affections of the retina are now quite generally conceded to be distinguishable in their single form, and to exist in combination with one another and to be directly related to definite clinical findings. The retinitis of arteriosclerosis as described by Foster Moore (1917) was the first definite classification to be made from the general

group of retinal disturbances that had come under the name of albuminuric retinitis.

Unfortunately, the use of the ophthalmoscope has been left largely to the ophthalmologist: practitioners who otherwise pride themselves on their equipment have quite generally excluded it. Ophthalmology as a specialty has grown farther and farther away from general diagnosis and even though the oculist may be skilled in the use the of ophthalmoscope, he has not the opportunity to apply it in general diagnosis to the best advantage.

The author urges all physicians interested in the progress of the science of medicine as well as in the refinement of their own methods of diagnosis, to employ the ophthalmoscope with the same regularity that they use the stethoscope and the speculum, and with the same desire to add to their keenness of perception the observations which are made possible by the ophthalmoscope and the foundation so generously laid down by Clifford Allbutt.

Slit-Lamp Microscopy in Every-Day Practice. Like all new thoughts, new theories, and new methods, slit-lamp microscopy is undergoing criticism, both favorable and adverse. In the judgment of a sufficient number of careful investigators, however, it has passed the stage of doubt. There seems to be no dissenting voice as to its value as a scientific instrument of precision. To decry belief in its so-called ultra-scientific possibilities would be an acknowledgment of total ignorance of the literature and the great amount of work which has been done in this field of investigation. But the clinical ophthalmologist raises the important questions: Is it of practical value in daily practice? Is it essential to his equipment? Will it enable him to obtain a better knowledge of the conditions which he is called upon to treat than the instruments and methods now at his command?

It is evident that comparatively few, thus far, have

learned to appreciate the true worth of the instrument. The reasons for this, according to Luther C. Peter,[6] are the same reasons which are usually applied to all new ideas. First, there is a general skepticism as to the practicality, in everyday practice, of an instrument so technical. There is a general belief that it is too scientific, too complicated and time-consuming, to say nothing of the expense, to admit of its use in a busy office. Second, this estimate of its value is the result of a lack of knowledge of its possibilities which retards its full appreciation. Until one has acquired its technic and has learned by experience what can be done and how time-consuming or time-saving the instrument may be, an incorrect opinion may be formed. Third, there are men today, as there were in the day of von Helmholtz, when he introduced the ophthalmoscope to the profession, who are satisfied with their present equipment, and who feel that by their present methods, which have stood the test of time, they are able to see and know all that is worth knowing of any particular case.

The value of this instrument can best be appreciated from a threefold aspect: (1) Its ability to confirm, analyze, and amplify what can be learned by our present methods; (2) the ability to determine in detail what our present methods cannot disclose; (3) the natural conclusion that because of its stated value in the first and second propositions, the diagnostic skill of the user of the slit-lamp is much increased.

One of the contributions by the slit-lamp of higher power is the presence of finely pigmented dust particles on the posterior surface of the cornea, in the aqueous, and in the vitreous. This pigmented dust is barely detectable on the cornea and in the aqueous by the ophthalmoscope. Its presence as a preoperative condition presages a bad prognosis postoperatively. The author's experience during the last two and a half

(6) Atlantic M. J., May, 1926.

years has led him to postpone intra-ocular operations when this condition is present, until suitable constitutional treatment has caused it to disappear. Post-operative iritis in cataract extraction may in many instances be due to lens sensitivity, but many cases are due to an autointoxication which is revealed by slit-lamp microscopy in the presence of these pigmented dust particles.

The second method of study in this group of cases which has crystallized some of our hazy and more or less nebulous observations by present methods is that of sectioning the lens by a thin beam of light. A demonstration of studying the lens by serial sections with the light beam is probably the most convincing argument in favor of the practical use of the slit lamp in everyday practice. When the proper technic has been mastered, the facility with which an exact knowledge of the lens can be acquired, with definite localization of any pathology, cannot be approached by the most clever manipulation of the ophthalmoscope or of the loupe and oblique illumination. It is quite possible to recognize incipient forms of lenticular opacities by the ophthalmoscope; but, after all, it is only the man of large experience behind the instrument who can definitely say that such opacities are congenital or nonprogressive, or that they are incipient forms of a progressive senile cataract. The slit-lamp, on the other hand, is so definitely localizing and discriminating as the light beam is passed through from equator to equator, that the conclusions of an average observer are so correctly formed as the opinions of the expert with the ophthalmoscope.

The question of one's ability to arrest the development of senile cataract is held in doubt by some, because many cases of so-called incipient cataract fail to develop after years of observation. The corneal microscope has done much to eliminate this element of doubt. It is possible, with the knowledge at our

command, to differentiate clearly between a congenital or postnatal condition of the lens which may remain stationary, and those forms of opacities which are early forerunners of a progressive senile cataract. The possibility of arresting this latter process is not under discussion, but those who feel that a senile cataract must go on to maturity and the patient must supinely await such maturity before relief can be given, will find it of interest and profit to study a series of cases of lenticular opacities by means of the slit-lamp, before and after suitable arrestive treatment has been practiced.

In the second group of cases (namely, those in which the slit-lamp reveals conditions not uncovered by our usual methods) may be mentioned, early evidence of sympathetic disease, and of other forms of infection in the aqueous or vitreous and on the cornea, minute changes in the epithelium and endothelium of the cornea, and early iridic changes and conditions included in the first group which are only recognized by masters of the other instruments at our disposal.

To one who uses the slit-lamp as part of a daily routine in selected cases, the disclosures of the corneal microscope are a revelation, first in giving definition and clarity to clinical conditions which are otherwise indistinct and confused, and second, in bringing into view clinical conditions which were not even suspected.

The natural corollary to these two premises, to which all slit-lamp workers will subscribe, is the fact that from a purely clinical standpoint, slit-lamp microscopy raises the diagnostic skill of any one who becomes interested in mastering its moderately difficult technic. This can be accomplished, under proper instruction, in a comparatively short time. It cannot replace either the ophthalmoscope or the loupe, as it is but an adjunct to both, but as a practical instrument for everyday use, it opens up a new epoch of progress in ophthalmology. It is an instrument of

great practicality, a refinement in diagnosis, and essential to the proper interpretation of many conditions which otherwise will remain obscure. Its field of application is large. Although of great scientific value for minute study as a laboratory instrument, it is equally valuable in making our everyday clinical work more exact and scientific.

[Because of the infrequency with which the slit-lamp is used in routine examinations, it has been suggested that where a number of oculists are grouped in the same suite of offices, which is becoming more common, one slit-lamp can be owned cooperatively.—Ed.]

A New Test for the Light Sense. Light minimum tests are valuable in such diseases as retinitis pigmentosa, luetic retinitis, hereditary night blindness, and generally speaking in diseases of the retina or choroid as distinguished from those in which the conducting fibers of the optic nerve are impaired. Lowered ability to recognize the proper threshold value of light is due to damage to the perceptive rods of the retina, whereas when the patient's statements in the light difference test are appreciably at variance with the law of Fechner, then the conducting power of the optic nerve is impaired. In many chronic cases of secondary optic atrophy the values of both the light minimum and the light difference are considerably removed from the normal values in the same patient and at the same time.

Graydon Hume[8] has devised an apparatus for the accurate determination of a patient's sensitiveness to light increments superimposed upon the initial source of an illuminated area. The optical system used gives a definite comparison between two areas of light, made apparent to the patient by interposing different stencils of various letters. The special diffusing screen gives true definition at an angle of 15 degrees either side of the normal. The percentage increase of intrin-

(8) Lancet, June 2, 1926.

sic brightness is indicated by black figures on an illuminated background at the side of the instrument discernible to the operator only. A shutter cuts off the main illumination to enable the light minimum by comparison to be obtained.

Diagnosis

The Eye and the Internist. As methods of diagnosis become increasingly complex and the physician grows to depend more and more upon the laboratory, there develops inevitably a tendency to neglect the simpler art of physical diagnosis. We forget that the accuracy of the laboratory is often specious, that many a disease cannot be detected chemically or serologically, and that time and again a diagnosis is written upon the very countenance of the patient, have we but the wit to recognize it.

Diagnostician and criminal detective have this in common: that for each the discovery of a clue is a first and an essential step in the train of reasoning. Each in his own field must be quick to sense the possibilities suggested by the infinitesimal deviation from the normal; the detective by a blood stain or a bit of ash, the medical man by a tiny gland or a barely palpable spleen.

Every square millimeter of body surface may offer a clue. Under appropriate circumstances a single macule may arouse suspicion of typhoid, of measles, or of bacterial endocarditis. The eye, however, as pointed out by M. Fremont-Smith[9] holds within its small compass more possible general diagnostic information than can be obtained from any other one region of the body; and this fact entitles it to a very respecful consideration from the diagnostician.

(9) Boston M. & S. J., May 27, 1926.

A man was recently admitted into the Boston City Hospital presenting a liver of monstrous dimensions. The discovery of a glass eye suggested the diagnosis, confirmed by watching the urine, normal when passed, darken and become black after exposure to the air. The eye had been enucleated for melano-sarcoma of the choroid.

The discovery in an unconscious patient of unusually soft eyeballs may prove of immense practical value, for this is a sign characteristic of diabetic coma and may almost be said to occur in this condition alone.

Loss of the outer third of the brow occurs in myxedema and may give a clue to a frequently difficult diagnosis. Uneven loss of eyebrow suggests late secondary syphilis—especially if irregular loss of hair over the temporal regions coexist. Thickening of the skin and subcutaneous tissue beneath the outer half of the brow is often the earliest symptom of nodular leprosy. An expert in this disease states that the diagnosis is frequently suspected by palpation of this region alone.

Puffiness of the lids we associate with nephritis. Trichinosis and arsenic poisoning, however, are not so often suspected; but edema of the lids is characteristic of both conditions and its discovery may save the physician from a mistaken diagnosis of "grippe" on the one hand or of simple gastro-enteritis on the other.

Lid-lag may lead to a suspicion of Graves' disease. Bilateral exophthalmos, a cardinal symptom, may be missed if the physician be not observant.

Protrusion of one eye may result from several general causes. A case which proved to be lymphatic leukemia, was referred for investigation of protrusion of one eye. Enlargement of a small mass of lymphatic tissue in the orbit must have been responsible. Unilateral exophthalmos may be caused by thrombosis of the cavernous sinus, by aneurysm of the ophthalmic artery,

or by tumor or abscess of the orbit. Severe frontal sinus disease may cause it.

Jaundice of the sclerae of course suggests obstruction of the common duct or infection or sclerosis of the liver. We think naturally of gallstones, carcinoma of the pancreas and of "catarrhal jaundice." Other possibilities, however, exist. Acute yellow atrophy is frequently not acute in onset, and may at first closely resemble infectious jaundice; a diagnosis of hemolytic jaundice may be suggested, to be confirmed by enlarged spleen and liver and increased fragility of red cells; or pernicious anemia may be discovered on examination of the blood smear.

A single peticheal subconjunctival hemorrhage may make the diagnosis of subacute bacterial endocarditis where previously only simple rheumatic heart disease was considered. Conjunctivitis, fever, and measles should be thought of together. Gonorrhea may be suggested by a profusely discharging eye. One of the characteristics of an epidemic of typhus once witnessed by the author was the early marked concurrent conjunctivitis. Russian physicians looked for the "rabbit eye" to help in making a diagnosis.

Conjunctivitis must be differentiated from iritis, so frequently a sign of extra-ocular disease. The deep purplish circumcorneal injection, the small, sluggish, grayish pupil, the tenderness and dimness of vision are characteristic. (Glaucoma, in turn, must be differentiated from iritis, especially as the drug most useful in the one is in the other absolutely contraindicated. An elderly patient complains of attacks of dimness of vision and presents a dilated, sluggish pupil and a shallow anterior chamber; or there may be an acute onset with pain in the eye and marked circumcorneal injection. Intra-ocular tension is increased in both acute and chronic forms. The treatment is the instillation of pilocarpin, causing contraction of the pupil. The use of atropin in such an eye often results in

entire loss of vision.) In the presence of iritis, syphilis is the first thought; next, focal infection from teeth, sinuses or tonsils. Gonorrhea, usually chronic, may be responsible, and "rheumatic" iritis is described, as is a gouty form and a diabetic. The internist is often tempted to refer the "eye case" to the ophthalmologist without realizing that here may exist a concrete evidence of constitutional disease as in skin, throat, or chest.

Corneal scars are of equal importance. One must remember that the late evidence of a syphilitic keratitis may be slight. Oblique illumination alone may bring into view the delicate grayish or white deposits. Bilateral interstitial keratitis is almost pathognomonic of congenital syphilis. Interrogation will bring out a story of pain, photophobia and disturbance of vision in childhood, with involvement of first one eye and later of the other, the inflammatory period extending over weeks.

Cataract occurs in diabetes, and when encountered before the age of fifty this disease must be excluded.

Of the twelve cranial nerves three are concerned with the movements of the eyeball, a fourth with the sensory innervation of the cornea, and the fifth with the organ's main function vision. A lesion in one of these nerves at any point in its course, is reflected in a functional derangement of the eye. Nerve connections exist, moreover, between ocular nuclei, cerebellum, and inner ear, so that disturbances in these two organs are commonly apparent in the eyes. When, in addition, it is recalled that the optic nerve may be visualized, and changes, not only inherent in the nerve itself, but secondary to variation of intracranial pressure and disease of the sinuses directly observed, the importance of the eye in neurological diagnosis is apparent.

Cortical or supranuclear lesions do not cause unilateral ocular palsies as the innervation of each of the eye muscles is a bilateral one. Consequently a uni-

lateral paralysis means a lesion in the nucleus or in the peripheral motor nerve. The nuclei of the third, fourth and sixth nerves, moreover, are so closely crowded together in the floor of the aqueduct of Sylvius that a lesion affecting one nucleus usualy involves all: consequently a nuclear lesion generally involves all the muscles of one eye or several muscles. When one ocular muscles alone is paralyzed the lesion is situated in the peripheral course of the nerve, below the nucleus. Unilateral paralyses are, in fact, most commonly caused by injury to the nerves in their peripheral course and are the result of meningitis, of pressure, of sinus disease, or of neuritis, as that following diphtheria.

The sixth nerve is particularly exposed to injury owing to the length of its course to the orbit from its emergence at the junction of pons and medulla. External rectus paralysis may, therefore, be the only evidence of a generalized intracranial condition, such as meningitis or increased pressure; by the same token, paralysis of this muscle alone is of little help in localizing a lesion, as increase of intracranial pressure from tumors far distant may cause injury to the sixth nerve.

A history of diplopia, or the discovery of ptosis, or paralysis of any of the muscles of the eye, suggest a number of interesting possibilities. Syphilis perhaps claims first attention: this is the more likely if the paralysis occurs as an isolated finding, or if it be a transient phenomenon. It should not be forgotten that neuro-syphilis is often present with a negative blood Wassermann. Multiple sclerosis may also cause transient unilateral ocular paralysis. The ocular paralysis occuring in brain tumor appears usually after other symptoms and signs are already present. Tumors of the cerebellopontine angle in particular deserve attention: beginning usually with the unilateral tinnitus and deafness and attacks of vertigo, the first confirmatory evidence of this condition may be slight weakness

of the face, together with weakness or paralysis of the external rectus on the side of the tumor. Corneal anesthesia (absence of corneal reflex), often the earliest sign of fifth nerve involvement, may be sometimes demonstrated at this time.

In the patient more acutely ill, diplopia or ocular paralysis suggests botulism or encephalitis. Often the diagnosis of the latter condition rests upon a history of transient double vision, or the demonstration of paralysis of one of the ocular muscles. This symptom occurs typically at the very onset of the disease, and may be of only a few hours' duration. Loss of the associative movements of the eye caused by a lesion in the posterior longitudinal bundle is another characteristic finding of encephalitis. The eye shows no paralysis; all motions are possible to each eye separately, but the ability to move both eyes in the same direction or to fix both upon one object is lost.

The ocular paralysis occuring in meningitis will be accompanied by the other signs of this disease. Post-diphtheritic neuritis may involve the oculomotor nerve, giving rise to ptosis or squint, or more commonly to paralysis of the ciliary muscle with inability to focus the eyes upon near objects. The branch innervating the pupil is usually included in the neuritis, the pupil failing to contract either to light or to accommodation.

It is interesting that in trichiniasis accompanying the edema of the lids, already referred to, there may be great pain on movement of the eyes due to invasion of the ocular muscles by the embryos.

Contraction of the pupil is brought about through the oculo-motor nerve; dilatation by way of the sympathetics. Stimulation of the sympathetic chain in the thorax, neck or periphery, therefore, causes dilatation of the pupil. Morphin causes contraction of the pupil through stimulation of the third nerve; morphin poisoning may often be suspected from the pin point pupils;

and cocain poisoning from the marked dilatation induced through stimulation of the sympathetics. Small fixed pupils resembling those found in tabes may be the result of the use of pilocarpin.

Inequality of the pupils is a sign always to be seriously considered. While the pupils may be congenitally unequal, it is never safe to assume this to be the explanation. Many cases of neurosyphilis present anisocoria as the only evident abnormality.

Aneurysm classically produces, through stimulation of the sympathetic chain, dilatation of the corresponding pupil. Other thoracic tumors may do the same.

Irregularity of the pupils when definite and not traumatic in origin must be considered presumptive evidence of neurosyphilis. Besides irregularity, inequality and diminished or absent light reflex are usually found in the neurosyphilitic. (In a study of 50 tabetics recently reported the pupils were described as normal in only 3 cases. Irregularity as the only abnormality was found in 3 instances. Diminished or absent light reflex occurred in 47. It is interesting that the knee jerks were found normal in 15 of this series and that the blood Wassermann were negative in 16. The spinal fluid was abnormal in 48 and the Wassermann positive in 41 cases.)

Definite nystagmus will not be overlooked by the internist if he seeks for it. Its discovery at once arouses a number of questions. Are we dealing simply with an error of refraction, as in many cases of nystagmus in children, or with the result of eye strain due to imperfect illumination, as in miners? Is the case we have perhaps labelled hysteria really one of multiple sclerosis? Is the nystagmus due to labyrinthine disease or to tumor or abscess of the cerebellum? Or have we perhaps a case of tuberculous meningitis?

Defects of Vision.—Many a dunce cap has sat upon the head of the child who was defective only in sight. This one type of stupidity really curable should

not be overlooked; but children often do not recognize the cause of their difficulty. The tests are simple if the physician only suspects.

Yellow vision suggests santonin poisoning; it is not so well known that green vision may be the result of over-digitalization or of abnormal susceptibility to digitalis. The author has seen one such case.

Two types of hemianopsia (or blindness of half of the field of vision) are of practical importance: Bitemporal hemianopsia, occuring in pituitary tumor, in which there is a defect in lateral vision in each eye; and homonymous hemianopsia, in which the right or the left half of the visual field in both eyes is lost. This last occurs in lesions of the optic tract posterior to the chiasm. Suppose a brain abscess secondary to mastoid disease be suspected. It may be cerebellar or temporal, and to operate one must open accordingly below or above the tentorium. If a temporal abscess on the left side be suspected, in a right-handed individual, aphasia and astereognosis may be found; an abscess in the right temporal lobe, however, may give no clue to its position. The optic radiations, however, pass backward through the temporal lobes. If blindness (complete or partial) can be demonstrated in the left side of both fields, a right temporal lesion may be diagnosed. A hemorrhage affecting any portion of the optic tract posterior to the chiasm will give the same picture. For rough examination the finger held a few inches from the eye suffices.

Impairment of vision may be due to increased intracranial pressure, to diseases of the accessory sinuses (chiefly ethmoid and sphenoid), to poisoning from tobacco, alcohol, wood alcohol, quinin, chloral, lead and other industrial poisons. The visual defect in these toxic cases is usually central; peripheral vision remains good, and color sense commonly is affected first.

In chronic nephritis vision is not only commonly af-

fected, but is frequently the first subjective symptom. Sudden blindness may occur in nephritis unaccompanied by retinal changes. (Osler.) In diabetes the vision is not infrequently impaired, great improvement occurring with control of the disease.

The physician may be led to think of polycythemia through visual difficulty unexplained by the ophthalmologist. Friedenwald has collected a number of cases of this disease showing visual defects with and without changes in the fundi. The symptoms varied from hazy vision and scintillation or blind spots, to complete blindness. Choked disks may be seen in this disease. Internist and ophthalmologist both do well to remember such a diagnostic possibility.

Transient unilateral blindness may be the first symptom of multiple sclerosis. The point of chief diagnostic interest in this disease is its close simulation of hysteria.

Sudden unilateral blindness may be the result of hemorrhage into the vitreous, suggesting hypertension and arteriosclerosis, or it may be due to obstruction of the central retinal artery or vein.

Complete blindness of both eyes may be due to hysteria.

The finer points in examination of the fundus may well be left to the ophthalmologist, but the internist should make a practice of examining the fundi, as sole evidence of a disease process may be found here. In a case sent because of a doubtful Wassermann the only abnormality on physical examination was haziness of the right disk and an area of proliferation in the retina. This led to further Wassermanns, which proved to be positive.

The chief difficulties met with in the use of the ophthalmoscope are due to lack of acquaintance with the normal appearance of the fundus, and to insufficient dilatation of the pupil. While many eyes can be adequately examined without mydriasis, if difficulty

is encountered, a drop of homatropin 1 per cent. in each eye, instilled at the beginning of the examination will dilate the pupil sufficiently so that by the time general examination is completed a good view of the fundus may be obtained. Atropin or homatropin are both dangerous in glaucoma.

The internist should train himself to decide the following points: Is the disk of normal color, or is there pallor of the whole or of one side of the disk? Can the vessels be traced to their point of emergence, or does the disk bulge outward and cover the vessels as they meet? Are the edges of the disk clear cut or do they fade away into the surrounding retina? The first ocular sign of increased intracranial pressure is usually a blurring of the disk margins and a blurriness about the vessels as they emerge from the optic nerve. One must remember that the development and subsidence of choked disks takes an appreciable length of time Increased intracranial pressure may be present from one to three weeks before evidence of choking appears; choked disks may exist for some time after the intracranial pressure as determined by lumbar puncture has returned to normal. It should be emphasized that marked choking may exist without visual impairment, so the condition cannot be ruled out without a fundus examination.

Nephritis, diabetes and syphilis cause certain changes in the fundus which are recognizable as abnormalities even by the inexpert. Clouding of the vessels as they approach the disks, blurring of the disk margins, tortuosity and dilatation of the veins, small reddish or black spots of hemorrhage, or white areas of exudate or proliferation are not difficult of recognition. The eye grounds in chronic nephritis are often almost pathognomonic: flame shaped hemorrhages with white spots or radiating lines resembling the spokes of a wheel in the region of the mucula. "On the other hand a brain tumor may present ophthalmos-

copic appearances identical with those of a case af albuminuris retinitis.'' (May.)

In the eye and in no other portion of the body may the small arteries and capillaries be directly observed, and their condition determined. Sclerosis of these small vessels is shown by an irregularity of the lumen, beading of the red columns, and by an obliteration or narrowing of the lumen of the veins as they are crossed by the arteries.

It has been pointed out by O'Hare that the condition of the smaller vessels in no way parallels the degree of arteriosclerosis observed in the large arteries, and that there may be marked sclerosis in the vessels of the fundus with entirely normal radials and brachials. Moreover, it is probable that the appearance of the vessels in the ocular fundus gives a fair indication of the condition of the other small vessels throughout the body, for example, those of the kidney or brain. The prognostic value of an examination of the fundus is therefore evident.

The eye thus offers a wealth of diagnostic information. Few eye signs are final; most of them are suggestive, merely, of possibilities; but as clues to be followed up and proven or disproven by further study, they are invaluable aids in diagnosis. The eye deserves from the clinician the most profound respect.

Color Acuity: Its Importance in the Early Diagnosis of the Disease of the Conducting Paths and Centers and Diseases of the Neuro-Epithelium. A routine color acuity test is made by M. Earle Brown[1] upon all patients in conjuction with visual acuity tests as follows: After recording the amount of the manifest refraction, patients are required to determine the color of test objects placed 6 meters in front of them in a good light.

If a red test object of 2 mm., and a green one of 5 mm., can be discerned, the color acuity for red and

(1) New Orleans M. & S. J., April, 1926.

green are considered normal. A blue test object of 7 mm., placed 15 cm., eccentric to the point of fixation, if recognized is considered normal.

The color acuity threshold is determined by diminishing the distance between the patient and the test object, e. g., blue 5/6, red 4/6 and so forth.

When the color acuity threshold is below 6 6 for any of the colors, peripheral fields and central field studies are made.

Studies of the first hundred cases furnished considerable data, which is being tabulated with a view of standardizing the test, and will be reported later.

Most of the diseases of the conducting paths and centers as well as the diseases of the neuro-epithelium can be studied long before symptoms are revealed, and many cases of blindness prevented.

The simplicity of the test should commend it to medical examiners in schools, industrial plants, life insurance companies, and medical officers on recruiting duty in the Army and Navy.

Studies of diseases of the conducting paths and centers and of the neuro-epithelium and most especially those diseases of the visual pathway, behind the eyeball, are to an ophthalmologist using an ophthalmoscope, nothing more than a pathologist gazing through his crystal at a pathological field in the background of a living eye.

We then must necessarily conform to the studies of Peters, with the perimeter for the methods so valuable in the early diagnosis of such diseases. It is, of course, impossible to make perimetric field studies upon all patients. However, the author's method of using the color acuity test will serve as an effective diagnostic aid in many esacs.

The Slit-Lamp in the Diagnosis of Glioma and Pseudoglioma. Illustrating the difficulty in deciding between glioma and pseudoglioma in some cases, Harri-

son Butler[2] relates that an erroneous diagnosis was made in three cases. The slit-lamp should help in the diagnosis. A child of five with a doubtful white mass in the vitreous was thus examined. White cells were seen circulating in the anterior chamber, the retrolental space was full of cells. From the slit-lamp examination the condition was almost certainly inflammatory. Notwithstanding this, the eye was enucleated. No tumor was found. The author will welcome an opportunity of examining a true glioma by the slit-lamp to satisfy himself there are no cells in the anterior chamber or retrolental space.

The Value of a Field of Vision in the Diagnosis of Eye Disease. Comparatively little has been written on this subject, and N. H. Bowman[3] calls attention to the rather humiliating fact that perimetry is not much employed by the rank and file of ophthalmologists in this country. That it has an important place with the various other methods of diagnosis is no longer questioned.

There is scarcely a lesion within the eye, which is not accompanied by symptoms discoverable by the perimeter. There are, however, many lesions of the fundus, and visual tracts, that cannot be detected with the ophthalmoscope. By the use of the ophthalmoscope, the observer possesses the means of inspecting and studying directly and indirectly many of the changes that occur in the media, retina, choroid and sclera. Only those changes of macroscopic size are open to inspection, while the smaller or microscopic lesions cannot be seen with the ophthalmoscope. It is in this latter type of lesions that a field of vision is of greatest importance. On the other hand, gross lesions of the fundus and media are confirmed and amplified by a field of vision.

In atrophy of the optic nerve much misunderstanding apparently exists in the mind of the profession about what is expected of the ophthalmoscope in this disease.

(2) Arch. Ophth., March, 1926.
(3) Texas State J. Med., August, 1926.

The writer makes mention of this fact only in the light of a caution and to avoid error in doubtful cases where a fundus seems to be normal or possibly negative, and which, in truth, may be very far from the facts in the case. It is only after an atrophy of the optic nerve has advanced to the stage of showing gross lesions that we expect to be able to determine its character with the ophthalmoscope and say that such a condition exists. A similar example of the importance of an early diagnosis may be noted in a case of tuberculosis of the lungs, in which the patient is observed so late that the most casual observer may detect the physical signs of disaster and all hope of relief is gone. Early diagnosis is essential in optic atrophy; never wait for gross lesions to appear before making the diagnosis. In optic atrophy where the visual tract is diseased above the primary optic centers, the ophthalmoscope is of little use because in such a case the nerve head itself does not show signs of the disease. Therefore, a field of vision is of value in the diagnosis of intra-ocular disease and positively the *sine qua non* in the diagnosis of disease of the visual tracts posterior to the eyeball.

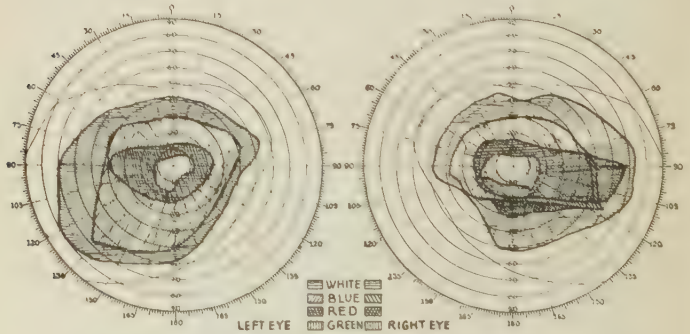


Fig. 2.—Primary optic atrophy, early stage.

A field of vision should be made in every case where there is evidence of deteriorating visual acuity. These are the patients seeking glasses, many of whom are be-

ing treated by optometrists to their eternal detriment, at a time when a physician might save them their most precious heritage. Every physician should see to it that his own patients are properly advised about having glasses prescribed, lest they fall by the wayside and get into the hands of men who have succeeded in forcing themselves upon the medical profession under the guise of "doctors" of optometry.

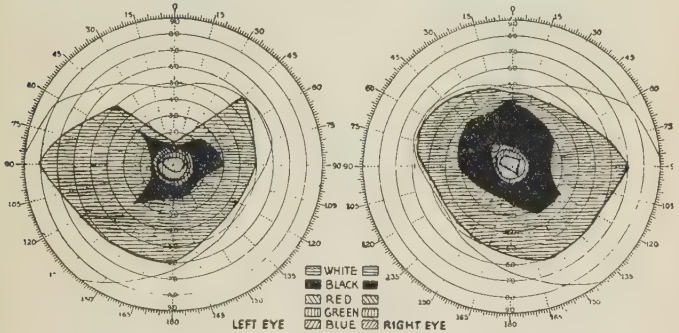


Fig. 3.—Showing ring scotoma of retinitis pigmentosa.

There is always a contraction of the visual field for colors in optic atrophy. At this early stage, when the

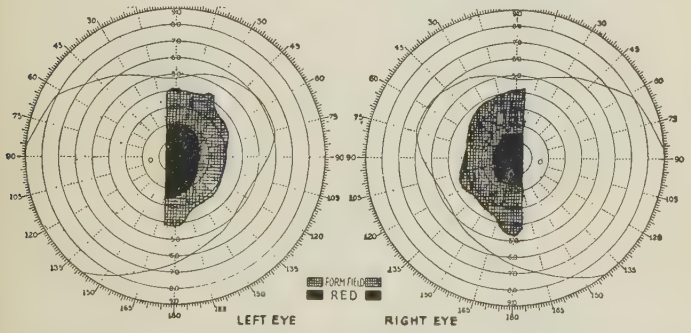


Fig. 4.—Bitemporal hemianopsia in a case of pituitary disease.

white is little, if at all, contracted, the vision is only slightly diminished.

Perimetric findings accompanying the various lesions described in the author's paper, from his own observation, are well illustrated in the diagrams. (Figs. 2 to 6.)

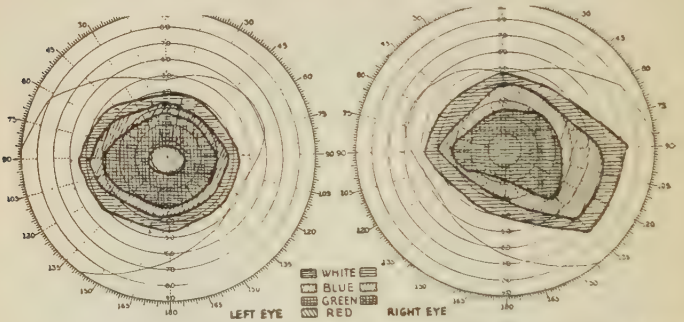


Fig. 5.—Toxic amblyopia. Right eye shows total loss of red field, and this field greatly contracted in left eye. Vision: O. D.—10/20; O. S.—6/10.

Keeping in mind the physiology of vision as applied to the different structures of the visual tract, we are enabled to appreciate any deviation from the nor-

Fig. 6. After five weeks therapy of pituitary and thyroid gland substance. Left eye shows visual field of a normal individual, for comparison.

mal in a field. The essential colors of a field are green, red and blue. White represents the form field. The behavior of these colors constitutes the key to a diagnosis. Contraction of the blue out of proportion to

the red and green indicates an involvement of the choroid and a disturbance of the rod and cone layers of the retina, which is usually the case in chorioretinitis. If the green and red fields are contracted, with little or no contraction of the blue or form field, the inner layers of the retina and the ganglionic axis cylinders, which form the optic nerve, are involved. The charting of the visual field is an invaluable aid to diagnosis of gross lesions of the eye, and indispensable when changes are so minute that the ophthalmoscope fails to definitely locate the site of the disease.

[For the detection of minute pathologic changes situated very near the optic nerve, the ordinary perimeter is not well adapted. In these cases one of the varieties of tangent-screens should be used.—Ed.]

Refraction and Accommodation

The Use of Cross Cylinders in Refraction. Our problem in refraction is to select the method which gives us the most reliable results and the patient the greatest comfort and improvement in vision in the limited amount of time which we can give to one case. The element of time consumed in doing a careful and accurate refraction probably accounts for the fact that good refraction is by no means general, even among those who are considered leaders in our profession. The advantages accruing from the use of the cross cylinder will, according to V. R. Hurst,[4] aid materially in solving this problem in that its use simplifies the work of refraction and insures accuracy with the least expenditure of time and energy.

A form of cross cylinder was first described by Stokes in 1849, but we are indebted to Edward Jackson for the first description of a practical use of it. In 1887 he advocated its use as a supplementary lens to

(4) Texas State J. Med., April, 1926.

the trial case for the determination of the amount of astigmatism, and in 1907 he suggested its application for the determination of the axis.

The cross cylinder lens has in one axis the action of a convex cylinder and in the axis perpendicular to the former the action of a concave cylinder of equal refractive power. For convenience in grinding it is made as an ordinary compound lens, having a minus sphere on one side and on the other a convex which is double the strength of the sphere. Thus a minus 0.25 S. combined with a plus 0.50 cylinder makes a 0.25 D. cross cylinder, *i.e.*, one having a refractive power of 0.25 D. in each of its principal meridians, one being plus and the other minus. The lens is mounted in a rim with a handle placed midway between the axes so that when the handle is rotated between the thumb and index finger there is an instantaneous shifting of the axes through 90 degrees. The lens should be marked with dots of different colors to indicate its two axes.

The chief advantage in the use of the cross cylinder is based on the fact that all changes of sensory impressions are perceptible in proportion to the time consumed in making that change. We may travel on a railway train from a point at sea-level taking several hours or days to reach the Rocky Mountains without noticing the change in sensation of altitude, but if we ascend to the same height in a balloon, requiring only a few seconds, the change is very marked. The same is true in the subjective tests of refraction: the perception of a change of lens and the definiteness of the patient's answer depends on the suddenness of that change. In testing with the cross cylinder the patient is given an instantaneous choice between two combinations.

The method of using the cross cylinder is almost as simple as that of using any other lens from the trial case. After placing in the trial frame the approximate

correction as found with the retinoscope, or any other method, the cross cylinder is held in front of the eye with first one axis and then the other coinciding with the axis of the cylinder in the trial frame. If we have hyperopic astigmatism with an axis at 180 degrees and the better vision is obtained with the two plus axes coinciding, the strength of the cylinder should be increased, or if the minus cylinder is preferred in this axis, the cylinder should be decreased. After the change is made the test is repeated until the patient does not notice a difference in the two positions of the cross cylinder, which indicates that the cylinder in trial frame is the correct one. With any of the cross cylinder tests the vision in most cases is not so good with the cross cylinder before the eye, so it should be explained to the patient that you are not at this time trying to improve his vision, but only asking for a preference between two positions.

If there is no cylinder in the approximate correction, or if the preliminary test is being made, the presence of astigmatism can be quickly determined with the cross cylinder. After the best vision is obtained with spheres, the cross cylinder is held in front of the trial frame in any convenient position, and handle rotated. If there is no preference as between the two positions, the handle of the cross cylinder is shifted 45 degrees and test is again made, only the two tests are necessary to detect astigmatism in any axis. If one position gives better vision, place either a plus or minus cylinder in the trial frame in the axis corresponding to that of the same sign in the cross cylinder. Test again with spheres and proceed as described in making a test for the strength of cylinder.

The cross cylinder test for axis is based on the principle that two cylinders superimposed with their axes at an acute angle have the cylindrical effect of a third cylinder whose axis is placed between the axes of the component cylinders. In making this test the cross

cylinder is held so that its handle is perpendicular or will coincide with the axis of the cylinder in the trial frame, making each axis of the cross cylinder 45 degrees from the axis of the trial cylinder. In this position, rotating the handle of the cross cylinder causes each of its axes to turn first 45 degrees one way from the axis of the lens in the trial frame, and then 45 degrees the other way. When the patient states which is the preferred position, the axis of the trial cylinder is moved a few degrees toward the axis of the cross cylinder of like sign. If there is a plus cylinder in the trial frame with its axis at 180 degrees, the plus axis of the cross cylinder would be at 135 degrees and the minus axis 45 degrees, and vice versa, when the cross cylinder is rotated. If the first position (plus axis 135 degrees) is preferred, the axis of the plus cylinder in the trial frame is moved a short distance in that direction, and the test is again made, always keeping the axes of the cross cylinder 45 degrees from that in trial frame. When a point is reached where the vision is the same with either position of the cross cylinder, we have found the correct axis for the cylinder.

One would be guided as to the strength of the cross cylinder to use in any case by the visual acuity of the patient, just as in using simple cylinders. The higher strength ones, as the 0.75 D. and 1.00 D., are of value in testing aphakic or relatively amblyopic eyes. The 0.25 D. and 0.50 D. are used in most cases with the final estimation to be made with the 0.12 D.

Myopia and Its Treatment. While myopia is brought about in a number of ways, short-sightedness as generally understood (axial myopia) is due to an elongation of the posterior half of the eyeball, with the posterior pole as the site of greatest change. This malformation brings in its train a large series of untoward effects, which are briefly enumerated by W. G. M. Byers[5]. With the lengthening of the eye a marked

(5) Canad. M. A. J., May, 1926.

change takes place in its refraction. Parallel rays of light fall now not upon, but in front of, the retina; and distant vision is impaired. The school board and objects of nature become alike a meaningless blur. As a result, not only is the myopic child's intellectual progress impaired, but its physical activities are restricted, and even its mental outlook may be influenced in an unfavorable way. Moreover, because in order to see objects clearly the myope must either approach them or bring them closer to him, those so affected are prone to develop postural defects that tend of themselves to increase the short-sightedness.

Much more serious are the pathological changes that develop within the globe mainly as the result of the inability of the retina, the choroid, and the elastic lamina to stretch equally with the sclera. Among them are congestion of the optic nerve and retina, chorioretinitis with areas of atrophy about the optic disk and in the macular area, hemorrhages, and detachment of the retina. All these entail a loss of central (reading) vision that varies from slight diminution to complete blindness. About 13 per cent. of all cases of total blindness are due to short-sightedness. One might comment further on the effect of myopia in producing weakness of the muscles of convergence and divergent strabismus, and on the accompanying pain and discomfort, the headache and reflex symptoms (asthenopia) that are present from the outset: but enough has been said to emphasize the gravity of the disorder.

No entirely satisfactory explanation has as yet been advanced regarding the precise mode of development of axial myopia; but among the contributing factors two causes play a predominant part. The one is a weakness of the scleral coat, either of congenital origin or the result of nutritive disturbances; and the other is prolonged application of the eyes for near work, such as entailed by certain occupations, or is imposed by the necessities of modern school life. Simple at

first glance as these factors may appear to be, they yet present a therapeutic problem of the broadest character.

The treatment of myopia begins properly with its prevention. This leads us at once into the whole subject of school hygiene. A healthful situation for the school building, adequate playgrounds, and a good system of ventilation, in promoting the general welfare of the child, exert a definite influence upon the strength of the scleral coat of the eye. Equally important, looking to the same result, is the removal of all physical defects, the regulation of the diet, and insistence upon adequate sleep and correct habits. In combating the second factor—excessive and prolonged convergence of the eyes—thought must be taken of lighting, seating, blackboards, and print and paper; while the early detection and correction of an initial weakness of sight is also of great importance. A routine medical examination of all school children provides the sole opportunity of studying the physical problems of the individual pupil.

In the treatment of developed myopia the full and accurate correction of the error of refraction stands as the first therapeutic measure. This, which alone can be successfully done under atropin mydriasis, acts beneficially in several ways. In enabling the student to again assume an erect position, it reduces the degree of convergence and lessens the tendency to congestion of the eyes; it eliminates stooping and reacts favorably upon respiration; and it promotes the intellectual and moral development of the child through the acquisition of clear ocular perceptions. Following the prescription of glasses, every effort is made to better the patient's health along the lines previously indicated; and reading is restricted proportionately to the degree of short-sightedness. Generally speaking, myopia can be successfully controlled by the adoption of these measures; but in certain cases the short-sight-

edness continues to develop in spite of everything that can be done. Under these circumstances no course is left but to order the removal of the children from school; to tell the parents that any further education can only be obtained at a possible cost of blindness in in the later years of life; and to suggest careers that can be more safely followed.

The great difficulty in the treatment of high myopia is our inability under present conditions to prevent excessive use of the eyes for close work. As things now stand it is impossible for bad cases to maintain their standing—or, even to receive any sort of education—without grave risks. Our school curricula should be made sufficiently elastic to permit pupils seriously affected to cover the prescribed courses in periods longer than those required of children with normal vision. In rapidly progressive cases of high degree (malignant myopia) home study, which, in any case, is now demanded to an extent beyond all reason, should be entirely interdicted, and instruction carried on in what have become known as "myope" classes. In these, small groups of short-sighted pupils prepare their work in isolated rooms, where teaching is done orally and by means of the blackboard before joining the main classes for recitations. The value of this method, successfully followed in Great Britain for over a decade, has been again emphasized in a recent report of the Council of British ophthalmologists; and in this connection it has been lately pointed out that the educational possibilities of broadcasting and the phonograph, of the epidiascope and the cinematograph are as yet a practically unexplored field.

Myopia in all its phases is a pathological condition, and it is as unwise as it is illogical to entrust the treatment and management of myopic children to any but qualified members of the medical profession.

[It often happens that young women having a moderate degree of myopia, strongly object to wearing

glasses and are satisfied with the vision they have rather than to be bothered by glasses. If the myopia shows no signs of advancing they are told that it will not injure the eyes if glasses are not worn.—Ed.]

High Myopia as a Degenerative Process. The myopic eye may be classified into two groups or types. The overgrowth myopia, which may be considered a developmental anomaly, and secondly, progressive myopia, which is a disease or a degenerative process.

The degree of myopia marking the point of distinction between the two types is only arbitrary and of course variable. It may be estimated to be from —3.00 to—6.00 D, for higher degrees are definitely more progressive and likely to be accompanied by the degenerative fundus changes.

Causes that have been advanced in the past to explain high myopia have been numerous, such as, close work or school myopia, in producing excessive accommodation, a position of the head so that the eyes tend to drop forward in their orbits and extrinsic ocular muscle influences as in convergence and the like. Second, relative or absolute shortness of the optic nerve.

Third, shape of the orbit which tends to mould the shape of the eyeball, and so forth.

Fourth, all conditions interfering with the passage of light through the ocular media, such as opacities of the cornea, lens and vitreous body have a tendency to make an eye myopic, but only to a very limited degree.

Granted that keratoconus of whatever cause makes an eye myopic, H. J. McCoy[6] looks for the basic causes of the malignant and progressive form of myopia, where the pathology is in the posterior segment of the globe.

All the causes previously mentioned have not stood the test of thorough and general investigation for the

(6) J. Iowa M. Soc., November, 1925.

basic etiological factor in high and progressive myopia. It is well known that myopia tends to occur in families or generations of families. Why is it then the law of heredity is not more definite? It is due to the fact that our knowledge of heredity in families is incomplete. It has been worked out in the laboratories of the University of Chicago, as reported by Dr. Wells, that a thorough knowledge of the pedigrees of ten generations must be at hand before we can begin to know what to expect in the following generation.

Walter Jablonski (Klin. Monatsbl. f. Augenhlk., Stuttgart, 68-560, May 16, 1922) considers myopia of more than 3.00 D to be undoubtedly hereditary. His statistics include mainly myopias of 6 D. He says these are certainly genotypical (acquired by hereditary constitution) and not modifications. He gives a short summary of heredity and the rules for dominant and recessive stigmas. The dominant elements are always directly inherited, healthy children are never the offspring of two pathologic parents; healthy parents may have pathologic children. A genealogic table in his article illustrates myopia in four generations, a second table demonstrates that myopia is a recessive characteristic. An exact investigation of the course of heredity according to the two Weinberg methods, that of fraternal relationship and of reduction, demonstrated that myopia is probably transmitted as a monohybrid (determined by one factor only) recessive factor in accordance with the Mendelian Law.

S. Drualut Roufesco (Ann. d'ocul. Paris, May, 1922), studied 5,251 cases of refraction, of these there were 1,714 cases of myopia. He concluded that myopia is a condition of familial and hereditary refraction and that it is variable and progressive and in mild and severe forms it is evolutive and it is pathologic when it progresses rapidly, also that in case of hereditary predisposition hypermetropia may give way to myopia or may remain stationary.

Other facts we have also point to heredity as the real fundamental cause of myopia. It is also a racial disease. It is said that it is commonest in the Roman Campagna because for centuries this area has been the recruiting ground for the constant wars of the past. the myopic was rejected for military service and lived to perpetuate his kind. Myopia is notoriously prevalent in Germany, decimated by the "thirty years' war", and among the Jews. Myopia is rare in Britain, a country that has been spared the annihilating wars of the continent.

Progressive myopia as stated has its pathology in the posterior segment of the globe. The types of pathology are—

1. Conus or myopic crescent.
   (a) Congenital conus.
   (b) Acquired conus.
      (1) Retraction (acquired myopia).
      (2) Supertraction (acquired myopia).
2. Staphyloma posticum.

This is pouching of the posterior pole of the eyeball generally in the region of the macula due to a weakened condition of the sclera. The excessive stretching causes secondary degeneration of the choroid and retina. The primary cause then in a progressive high myopia is a hereditary degeneration of the sclera in the posterior segment of the eyeball.

It is generally considered that in infancy the refraction is one of hyperopia unless there exists at birth a congenital defect. We have the scleral tissue apparently developed in a normal way but for some reason the resistance of this tissue is weak and is unable to maintain its physiologic function, so it relaxes or degenerates. So far as our knowledge goes there is no endogenous substance such as the secretion of one of the endocrine glands upon which the sclera is dependent for its vitality, although Raul Arganaraz, (Semana Med. Buenos Aires, 49-1161, December 7, 1922), re-

jects the theory of heredity on the basis of its occurrence in only one eye sometimes, which is one point that does not parallel Collins' "Hereditary Ocular Degenerations," and by his own clinical experience. He claims "that the cause for this abnormal ophthalmic condition can be established only by a general clinical examination of the patient and this regularly shows the existence of pluriglandular disturbances of the endocrine system due either to hyperfunctioning or hyprofunctioning, usually of the thyroids and testicles, or thyroids and ovaries, sometimes of the hypophysis. Nor do we as yet know of any toxic material developed endogenously, capable of producing this weakness of the sclera. Even if such a toxin or internal secretion be discovered to account for the hereditary nature of this affection, it will still be necessary to assume some innate weakness in the sclera, or in the case of some internal nutrient secretion, some innate tendency to a failure in its supply.

The occurrence of the degeneration of the sclera in several successive generations of the same family renders it impossible to attribute it entirely to the absorption of any exogenous toxic substance or to the absence of any exogenous essential nutrient material such as a vitamin.

High progressive myopia is, therefore:

1. A degeneration of the sclera due to an inherent weakness or lack of vital force in the scleral tissue cells, having a hereditary transmission.

2. That all other causes advanced to explain high myopia are only secondary factors or a part of this hereditary weakness manifested in other tissues.

Total and Reserve Accommodation in Presbyopia. The determination of the punctum proximum is one of the essential tests of every complete refraction of all intelligent patients. This should be determined by some actual accommodation tests, rather than by estimating it from the patient's age. The amount of the

added lens for near vision is based upon the patient's accommodation. The presbyopic eye must keep some of its accommodation in reserve in order to do near (33 cm.) work comfortably. The average amount of reserve necessary for a normal presbyope is designated as normal reserve accommodation. The relation of the normal reserve to the total accommodation is expressed by F. J. Slataper,[7] in three formulas divided according to the amounts of total accommodation.

1. Certain controls are emphasized for the accurate determination of total accommodation: (a) A test object of two parallel lines similar to Duane's "accommodation line," is moved away from the eye; (b) moving printed letters or words away from the eye as used by Donders; (c) always testing at approximately 33 cm.

2. In presbyopia, the relation of the total accommodation to the normal reserve accommodation can be expressed in diopters as follows: (a) When 1.0 or less, the normal reserve is equal to the total accommodation; (b) when from 1.0 to 1.9, the normal reserve is equal to the total accommodation: (b) when from 1.0 to 1.9, the normal reserve is equal to 1.0; (c) when over 1.9, the normal reserve is equal to 1.0+ (total accommodation—1.9) 0.353.

3. A table, based upon the above formulas gives the standard add for near in accommodation from 1.0 to 4.50 diopters and for working distances from 50 to 28.5 cm., with the quarter diopter as the unit. When the total accommodation is less than 1.0, the same add is indicated as for 1.0 diopter.

The normal reserve accommodation estimated by the formulas or the standard add found in the table, each furnish a norm that can be intelligently varied in the near correction of certain anomalies such as convergence insufficiency, unequal accommodation, and so forth. The table is also convenient in saving calculations in the refraction of most cases of presbyopia.

(7) Texas State J. Med., January, 1926.

The Mechanism of Accommodation. The two opposing theories of the mechanism of accommodation as expounded by Helmholtz and Tscherning, are analyzed by P. Obarrio,[8] who thus summarizes his conclusions in favor of the latter theory:

1. Experimental data reveal that the contraction of the ciliary muscle enlarges the ciliary opening producing tension instead of relaxation of the suspensory ligament.

2. When the lens is removed from the young eye and allowed to assume the form given it by its own elasticity, its shape becomes more or less globular or spheroidal, which is not the shape that it assumes during the act of accommodation.

3. Repeated measurements of the displacement of reflected images demonstrate that during accommodation the surface of the lens has a considerably greater curvature in the center than at the periphery.

4. The trembling or jumping motion of the images during accommodation is due to the vibratory action of all of the voluntary muscles, which is imparted to the lens through the ligaments.

5. The amplitude of accommodation diminishes toward the periphery of the pupil, and the contraction of the longitudinal fibers of the ciliary muscle exerts traction on the choroid, tending to give further support and consistency to the vitreous which in turn steadies the posterior surface of the lens.

6. Because of its extreme tenacity and elasticity and its dome shape, the posterior capsule cannot flatten out in the middle, but toward the periphery, where the cortex of the lens is considerably softer, it yields to the action of the suspensory ligament.

7. The increase in thickness of the lens during accommodation is due to the double pressure exerted upon the softer cortex by the vitreous acting on the posterior surface and the ligament acting laterally, these

(8) Am. J. Ophth., February, 1926.

forces causing a displacement of this softer mass toward the point of least resistance—the anterior capsule.

8. The descent of the image of the posterior capsule during an extreme effort of accommodation is due possibly to a very slight tilting of the lens in its horizontal axis and probably also to slight motion of the eye itself.

9. It must be borne in mind that, during consciousness, all involuntary muscles maintain a state of tone, and that therefore the ligament at all times exerts a slight tension due to the tone of the ciliary muscle and the elasticity of the lens capsule, principally the posterior capsule.

10. All of these facts are possible because of the action of Schlemm's canal as a safety valve in the anterior chamber.

Telescopic Spectacles and Magnifiers. Telescopic spectacles are constructed on the principle of a telescope, and the improvement in vision results from the enlargement of the retinal image. Attempts to develop such an instrument date back as far as the seventeenth century; it is only since 1909, however, that the Zeiss Co., of Jena, have placed on the market lenses which can be utilized for practical purposes. They have not come into general use because of their formidable literature and accompanying tables. As a matter of fact their use is very much simpler than this literature would lead one to believe. With the telescopic spectacles or magnifiers it is in certain cases possible to get useful vision, when with the best possible ordinary correction it cannot be obtained.

The telescopic spectacle consists of two lenses: a large converging lens, and a small diverging lens. By proper construction, these lenses give an image free from distortion, from astigmatism of oblique rays, and from disturbing color effects; this image is from 30 to 80 per cent. larger than that produced by the ordinary

lens. The price of the magnified image is a narrowing of the visual field which narrows in proportion to the magnification of the image. When the image is 80 per cent. larger the visual field is reduced to 24 degrees; therefore, if the patient has useful, even though low, distance vision you will be disappointed in the effect of the telescopic spectacle; in your office he will read instead of 20/100, 20/50, which will seem a remarkable improvement; and yet the patient will return with the statement that he cannot wear them, because he prefers a reduced visual acuity to the marked restriction of the visual field. For this reason Ray K. Daily[9] finds the usefulness of the telescopic spectacle for distance limited, except for use in theaters, schoolroom or church.

The telescopic spectacle for near vision is of questionable value; owing to their peculiar construction, the distance spectacles cannot be used for near without an additional lens, even in young people. This lens is attached facing the object, and the reading distance is equal to the focal length of the additional lens. Where the vision is greatly reduced the additional lens must have an amplifying effect in addition to the enlarging effect of the telescopic spectacle. Thus instead of adding a plus 4, it may be necessary to add plus 6 or plus 8, plus 10, or 12; in other words, it is necessary to try several different combinations. One can roughly calculate the strength of this additional lens from the patient's vision by remembering that with the amplification of the spectacle and reading lens the patient should have at least 20 vision, in order to be able to read; one can determine the strength of the lens accurately, however, only by trying the different combinations. The higher the magnifications, the closer must the reading matter be brought to the eye, and the narrower is the field of vision. This means great difficulty in learning to use them, because only a small

(9) Texas State J. Med., July, 1926.

amount of reading matter is visible at one time, and the patient is continually losing his place.

With binocular spectacles the optic axes should intersect at the reading distance and one cannot use the same pair for distant and for near vision, as in the case of the monocular spectacle, where the seeing is done with one eye, the other one having the lens nearest the eye opaque. Because of the difficulty of adjusting the binocular spectacle, and the double expense of two pairs of lenses, the monocular type has been most satisfactory to the author. The frames for the telescopic spectacles are made to support their weight, which is a little more than one ounce. The nose supports the bridge at three points: at the middle of the root of the nose, and on each side of the nose by means of little brackets. The frame should not slide up or down or tilt sideways.

When the corrected vision is below 20/200, the enlargement with the telescopic spectacles is still insufficient to give reading vision. We can then resort to the telescopic magnifiers. With these a magnification of three, six or eight times may be obtained for distance, and as high as thirty-two times for near vision. These magnifiers are built on the principle of a prismatic telescope, the enlarged object being viewed by means of a pair of mirrored prisms. Ametropes may wear their glasses with this instrument, or their correction may be incorporated in a glass at the eye side of the instrument. To the object side attachments for near vision, of various strengths, may be added, the strength of the lens divided by four giving the magnification. Thus a lens of 12 diopters will give a magnificaation of three, and such a lens used with a 6 magnifier, will give a combined magnification of 6 times 3, or 18. A patient with a vision of 10/200 by a magnification of 24 times is enabled to read; naturally the field is very small, and the difficulty of learning to use the magnifiers is very great; but with patience and perseverance

on the part of the patient, and with encouragement from the physician, it can be done. The magnifier is held in the hand, when the use of the hands is desirable, and head bands and lens stands can be obtained and the patient accustomed to them.

Three illustrative cases are reported by the author:

Case No. 1.—Dr. E. H., suffering from primary optic atrophy, had a vision of O. D.—16/200; with telescopic spectacles 20/150, which is an 80 per cent. improvement. With plus 9 added for near vision, he reads Jaeger 5, which is quite sufficient for ordinary reading. His left eye has a vision of 8/200.

Case No. 2.—Mr. R. E. D., 26 years of age, a newspaperman, had a retobulbar optic neuritis, with descending atrophy and central scotomata involving an area of 15 per cent. around the center, resulting in a vision of 14/200 in right eye eccentrically, and 10/200 in the left. Telescopic spectacles improved his distance vision, but reading vision was still impossible. With the telescopic magnifier 6 and a plus 14 lens for near vision before his right eye, he has a magnification of 21, and has resumed his work on the newspaper. In this case the magnifier saved this young man from a serious economic readjustment. He uses a headband for his magnifier and has his hands free. It required perserverence, patience and intelligence to learn to use them, but the result is remarkable.

Case No. 3.—Mr. J. A. C., 78 years of age, had a vision of: O. D.—20/200, with senile degeneration at the macula, some vitreous and lenticular opacities; O. S.—large central scotoma for light perception. The correction was as follows: O. D. with plus 1.50 S. plus 1.50 C. AX—180=20/100. With telescopic 20/70, and with plus 8 added for near, he reads newspaper print. This man's old age is made much happier by renewing his contact with the outside world through the newspaper.

The External Ocular Muscles

A Family of Squinters. Four cases of strabismus in one family are reported by F. H. Rodin[1].

Mrs. C. S., aged 46, seen at Stanford University Eye Clinic, July 14, 1925, had had fourteen children, nine of whom were living. Her right eye had always turned out. The eldest six living children and her husband have straight eyes. The eyes of the youngest three children turn in. These children were of normal birth and always healthy. The mother had always enjoyed good health. As far as can be ascertained, there is no history of strabismus on either the maternal or the paternal side of the family. (Plate II.)

Retinoscopy of the mother and the children was done under atropin mydriasis. The examination of the fundi in all these cases was negative. Lenses did not improve their visions nor straighten their eyes.

Examination of the vision of Mrs. C. S. revealed: O. D.=hand movement; O. S.=20/30. Retinoscopy: O. D.+2.00+2.00 axis 90°; O. S.+2.00 S. There was a right divergent strabismus, the right internal rectus muscle being very weak.

The eldest of the three children was a boy, aged 12 years. The right eye had been turning in since 2 years of age. Vision: O. D.=20/30; O. S.=20/30 part. Retinoscopy: O. U.+5.00 S. In a postmydriatic test, the patient accepted only O. U.+0.75 S. There was an alternating convergent strabismus of 30 degrees by the arc test, the left eye being the fixing eye.

The second child was a girl, aged 9 years. The right eye had been turning in since 2 years of age. The right pupil was larger than the left. Vision: O. D.=20/200; O. S.+20/40. Retinoscopy: O. D. +4.000+1.00 axis 135°; O. S.+4.00S+1.00 axis 45°. Postmydriatic test: O. D. did not accept any lens; O. S. accepted+1.00 S. By the arc test: right convergent strabismus 30°.

(1) J. A. M. A., May 22, 1926.

Four squinters in one family.—Rodin, page 58.

The youngest child was a girl, aged 6. The left eye had been turning in since 1 year of age. The child was too young for recording vision. Retinoscopy: O. U.+ 5.50 S. By the arc test: left convergent strabismus 30°.

Reasons for the Early Treatment of Squint. For the best welfare of the patient, the treatment of squint, according to M. F. Weymann,[2] should begin as soon as the squint is discovered, and the reasons for this are based upon sound physiological principles.

In the beginning, man developed binocular vision through the peculiar quality of a fusion sense, which sense is not present in the lower animals. Even in man it is not developed at birth, but is gradually assumed during the first years of life. Especially during the first year of infancy does this sense gain a foothold, and it is gradually strengthened during succeeding years until when the child is 7 or 8 years of age the sight of one eye may be lost and both eyes will still move synchronously because the muscles have become accustomed to coordination through fusion of the images. Mothers often claim that their infants look "cross-eyed" now and then. That is because they have not yet developed the fusion sense sufficiently to avoid some incoordination in movement of the eyes.

The impulses set up by images thrown upon the retina are transferred to the occipital cortex and there fused into one by the fusion sense, this being done to prevent one from seeing two objects where there is really one. But to fuse these images it is necessary that they be as nearly alike as possible, and to this end the eye muscles are coordinated to focus the two eyes upon the same object at the same time. When this is not done, double vision and discomfort result. Thus it is the fusion sense which prevents the discomfort of double vision, and this is accomplished by the desire for fusion of images causing the ocular muscles to work in harmony and give one "straight eyes."

(2) California & West. Med., March, 1926.

But in infancy, when the fusion sense is weak or immature, certain factors may hinder its complete development. And these factors act more powerfully in the case of those infants with an inherently weak fusion sense than in those with a strong one. For it seems that the fusion sense varies in individuals just as it does their resistance to infection.

One of the factors which would cause difficulty in the fusion of the images of the two eyes would be a clear image in the one eye and a distorted image in the other. That is, if one eye were highly nearsighted, farsighted, or astigmatic, and the other eye normal, the two images would be dissimilar and difficult to fuse. Thus an individual with a weak fusion sense would have difficulty with double vision, and to rid himself of this discomfort would unconsciously cause the abnormal eye to cross so as to make its image completely different and then suppress the image of the crossing eye entirely in the brain. Such a person would really have monocular vision and would be "brain blind" to the image in the crossing eye. As said before, this occurs as an unconscious act to relieve the individual of the discomfort of double vision, and is an easier alternative than to try to fuse the two dissimilar images.

In a child born farsighted in both eyes there is another factor working to hinder the fusion sense and to cause the eyes to become crossed. Normally, an individual, when looking at distant objects, is using no muscular effort in focusing, that is, the focusing apparatus is at rest, and there is very little convergence of the two eyes upon the object. But when such an individual looks at a close object the eyes must not only be focused upon it as one focuses a camera, but must be converged upon it as well. So that any impulse stimulating the ciliary muscle or focusing apparatus must stimulate the internal recti muscles to converge the eyes upon the object at the same time. Now if a child is very farsighted he must not only focus for near

objects, but must keep up a constant stimulus to the focusing apparatus to be able to see distant objects distinctly. This stimulus also affects the muscles of convergence and, unless the fusion sense is strong enough to overcome this tendency toward convergence, the eyes will turn in more than necessary, with the resulting formation of two dissimilar images and double vision. To avoid the discomfort of the double vision one eye will be allowed to turn far in and its image will be disregarded. Thus, a convergent strabismus will be produced, and the child will have monocular vision.

The child who is nearsighted has a similar condition to cope with, but here the stimulus to convergence is lessened and the eye usually turns out instead of in. It does not follow that all divergent squints are myopic, and vice versa, but that is the general rule.

As a result of the crossing of one eye and the disregardance of its image by the brain, we have one of the most serious complications of the neglected squint patient. If the eye of an infant is covered at birth, or if it is unconsciously thrown into disuse by crossing, as noted above, the visual acuity of that eye does not develop and it remains amblyopic or partially blind throughout life if the period of disuse is long enough continued. Therefore, if a child whose eyes are crossed is allowed to go untreated until 4, 5, or 6 years of age the vision of the crossing eye is permanently impaired. But if the child can be made to use the crossing eye as soon as possible after the crossing is definitely established, the chances for a return to normal vision of that eye are directly proportional to the earliness with which the treatment is begun.

No child over 2 years of age is too young to wear glasses, and many can wear them under this age if necessary. An oculist who gives as his only excuse for not treating a case of squint that the child is too young for glasses indicates that he does not care to take the

trouble for the examination of the child. Of course, there are some cases of squint where glasses are not necessary, but the oculist may say so after an examination, but the reason for not prescribing glasses should not be the age of the child.

The refraction should be done under atropin and a careful retinoscopic examination made. If the child is old enough to name pictures, the subjective test should be used as a check. Correction with glasses, where one eye is normal and the other ametropic, tends to make the images of the two eyes more alike and more easily fusible. In the case of farsightedness they remove the extra stimulus to convergence, and in nearsightedness tend to increase this stimulus. Therefore, myopic divergent strabismus patients are given as much correction as possible, while patients with myopia and convergent squint, and vice versa, are given only their astigmatic correction and exercises for developing the fusion sense.

After proper glasses have been provided, the crossing eye should be made to work by bandaging the good eye daily during waking hours for a month. Then both eyes are used for a few days, and the covering of the good eye repeated. This will not cause a diminution of visual acuity in the good eye, for when once acute vision is developed in the eye of a child it will not be affected by a few months' occlusion of that eye, and in an adult the eye may be covered for years without the loss of visual acuity. Many adults with cataract go for ten or more years with the opaque lens covering an eye, and upon its removal are restored to practically normal vision. But in the infant under 1 or 2 years of age the disuse of an eye for a short length of time means means a permanent loss of visual acuity.

Where the parents cannot be trusted to cover the good eye it may be put under the influence of atropin. This is not as good as covering it, but it makes the child use the crossing eye for all close work, or about

two-thirds of the time. When the vision of the crossing eye no longer shows any improvement, or when the strabismus becomes alternating, this measure is discontinued. If this treatment is begun when the child is about 2 years of age the vision of the crossing eye may return to normal, but in older children, although it will be improved, it rarely comes back to normal. Even children of 6 years of age and over show marked improvement, as evidenced by one child of 6 years, and whose vision in the crossing eye under the treatment of bandaging the good eye for two months improved from 20/240 to 20/30.

The other item in the treatment of these patients is the exercise of the fusion sense. This is done by means of the Worth amblyoscope, which is an arrangement of prisms and tubes, so adjusted as to allow the cross-eyed individual to see two cards at the same time and to try to fuse the pictures on the cards. For example, one card will be the picture of a bird and the other a cage, the object being to get the child to see the bird in the cage, or to superimpose the images in the brain.

Very nearly all cases of squint can be cured in this manner if seen early enough. But if the child is allowed to grow older before instituting treatment, the results are not nearly so good. Even if the eyes are straightened by operative procedure the chances of restoring binocular vision are much diminished in the older child. Under no condition is operative treatment to be advised until all of the above measures have been tried and until there has been no further improvement under this treatment in a period of three to six months.

When operation is done it should not be tenotomy of the overacting muscle. If tenotomy is necessary, in addition to advancement of the underacting muscle, which latter operation is that of choice, it should be regulated by setting the tendon back a definite amount and suturing it to the sclera. Otherwise there is the danger of a later strabismus in the opposite direction.

Divergent Strabismus. For several reasons, as pointed out by B. W. Egan,[3] an especial interest is associated with the study of the divergent form of concomitant strabismus. In the first place, as it is far less common than the convergent form, the etiology of its various types, insofar as relates to the muscular anomalies present, has been less thoroughly discussed. In the second place, the difficulties attending its rectification by surgical procedures are generally held to be greater than those connected with the correction of the convergent strabismus. Lastly, amblyopia of the squinting eye, defying improvement by correction of the refractive error, is by no means as common, and, if we believe that the irremediable amblyopia of strabismus is, for the most part, congenital and not acquired, does not seem to present itself as an etiological factor as frequently as in the convergent variety. While it must, of course, be admitted that a corneal opacity or a unilateral cataract, especially in an adult, will in many cases determine which eye shall diverge, it is certainly more common in divergent than convergent strabismus, and particularly in divergent strabismus associated with bilateral myopia, to find the vision equal, or nearly equal, in the two eyes after correction of the refractive error.

Divergent strabismus is quite generally regarded simply as a condition, diametrically opposed to convergent strabismus. We forget that, while one muscular anomaly alone, a convergence excess, is causative of most convergent strabismus, such is not the case in all instances of the divergent type. It is on account of the very general lack of recognition of this latter fact, that divergent strabismus is regarded by many as so much more difficult to rectify than is convergent strabismus.

Divergence of the eyes is accomplished by the simultaneous rotation of both eyes in an outward direction.

(3) J. Indiana M. A., March, 1926.

According to Dunnington, this act of diverging the visual axis probably is produced by simultaneous equal relaxation of both internal recti muscles, accompanied by equal simultaneous contraction of both external recti. There is a definite cerebral center to govern divergence. Neurologists are loath to admit the existence of such a center, but clinical evidence strongly supports the contention of ophthalmologists that one exists. Duane, who made a very thorough study of the ocular movements, is of the opinion that this center is in close proximity to the nuclei of the sixth nerve, which are situated on the floor of the fourth ventricle, near the median line. Errors of divergence result from an over action or under action of this center. A divergence excess is, therefore, present when the eyes possess an abnormally great power of simultaneous outward rotation. This is a common condition, and is the starting point for many divergent squints.

Etiology.—Based upon the general etiology, divergent squint is divided into the paralytic and non-paralytic types. The etiology of the convergence insufficiency cases may be found in general or special pathological states, as syphilis, chronic renal disease, autointoxication of intestinal and hepatic origin, and recent attacks of infectious disease, as epidemic influenza, diphtheria, typhoid fever, pneumonia ,or other exhausting affections. These may be responsible for the derangement of the innervation of the muscles and that, too, without inducing a condition of paresis. There may also exist as most efficient causes, foci of infection, located in the accessory sinuses of the nose, at the apices of the roots of the teeth, or in the tonsils.

Many cases of incoordination, due to such causes, may be temporary in character, and the muscular functions may return to normal after the removal of the general pathological state responsible, as in the toxemias due to foci of infection after eradication of the special infective foci, or in lues after a scientific course

of specific treatment in the absence of paresis, or in asthenic states after the bodily tone has been restored to normalcy.

The significance to be emphasized in this connection is this, that one should make himself certain, through careful inquiry into the individual's general bodily condition, that the existing muscle imbalance is not of a temporary character, due to pathological causes of the types mentioned, before resorting to radical measures of treatment, directed to the state of imbalance itself. Surgical treatment, for instance, under such conditions of temporary character, might eventually prove disastrous for very obvious reasons.

The permanent types of muscular incoordination point definitely to the fact that, in addition to the correction of the existing refractive anomalies, special attention must be given to the imbalance as a definite condition urgently demanding relief. The detection of such forms of imbalance frequently will furnish an explanation of the existence of serious states of functional nervous derangment, the causes of which previously have been undiscoverable.

It is very difficult to define accurately the etiology of the divergence excess cases. The secondary form follows convergence insufficiency simply as nature's way of making the deviation the same for both distance and near. The etiology of the primary type is not thoroughly understood. We know these patients are born with an over active power of divergence, but, due to the extreme activity of the converging power, it does not trouble the patient until later in life, just as a patient with a high degree of hyperopia may have no trouble from it until adult life is reached. All one can say is that primary divergence excess is due to a congenital over activity of the power of divergence.

Symptoms.—The symptoms are diplopia, and the reflex symptoms induced by the effort to correct the deviation. These are asthenopia, pain in the eyes, con-

junctival irritation, and headache, which may be superorbital, orbital, temporal, or occipital. Frequently, we also have digestive disturbances, nausea, and interference with the general nutrition. For obvious reasons, these symptoms, particularly the reflex disturbances, are more manifest in the periodic than in the continuous squint.

Types.—If we seek to classify cases of divergent strabismus according to their etiology, that is to say, according to their accompanying muscular anomaly, we find that they fall, as would naturally be expected, into three distinct groups: First, those accompanied by an insufficiency of convergence; secondly, those accompanied by divergence excess; and, lastly, those presenting both these anomalies in varying proportions. If we attempt to base the classification upon the accompanying refractive error, we again divide the cases into three groups: Those in which both eyes are myopic, those in which both eyes are hypermetropic, and those in which one eye is myopic, and the other hypermetropic. The second classification is the one usually adopted, but seems to the author to be faulty in that it takes no cognizance of the fact that any one of the three muscular types may be present. Further, it seems to him that it assumes that all cases of divergent strabismus are accompanied and caused by convergence insufficiency. Such is not the case, most certainly. On the other hand, a classification based solely upon the existing muscular error is not entirely perfect, inasmuch as the different muscular errors are not invariably associated with a constant error of refraction. Its practical value, as a guide to treatment, cannot be overestimated, and the fact that, in the vast majority of cases, there is a constant relation beween the muscular and refractive errors constitutes a strong plea for its adoption. On the basis of the predominating muscular error, we may, therefore, attempt the classification of divergent strabismus as follows: (1)

divergence excess, (2) convergence insufficiency, (3) a combination of divergence excess and convergence insufficiency. Divergence excess is usually associated with hypermetropia, and this group of cases constitutes by far the greatest number of all cases of squint. Myopia sometimes occurs in this class, but is rare. Convergence insufficiency constitutes the second largest group, and, in this class, myopia is most frequently found, hypermetropia rarely so. In the divergence excess and convergence insufficiency class antimetropia is most frequent; bilateral myopia and bilateral hypermetropia less frequent. By regarding divergent strabismus from this viewpoint, we obtain important indications in regard to operative measures, and can readily determine how much or how little is likely to accrue from correction of the refractive error.

The determination of the muscular anomaly in any case of divergent strabismus is simple. In a pure case of divergence excess, the deviation exists only when the patient gazes at distant objects. The power of convergence can be shown to be practically unimpaired by having the patient attempt fixation on the point of a lead pencil, gradually brought near to him in the median line. In typical cases, he will maintain bilateral fixation until a point within three or four inches of the root of his nose is reached. When this is the case, convergence insufficiency cannot be present. In a pure case of convergence insufficiency, the squint will be more marked for near than for distant objects, one eye diverging more and more as the pencil approaches the face. When divergence excess and convergence insufficiency are present, the deviation will be marked during both distant and near vision, and the power of convergence will be either entirely absent, or will be manifest only to a slight degree. Divergence excess, associated with hypermetropia, constitutes the majority of all cases of divergence, and that these cases develop into true squints about the time of puberty.

Treatment.—In the treatment of divergent strabismus, it is generally held that our first endeavor should be to correct the refractive error, and that, after such correction, a cure may result without resort to operative measures. A cure may be obtained, but only in those cases in which myopia, fairly equal in degree, is present in both eyes, and in which convergence insufficiency is the sole, or predominating muscular anomaly. Correction of the refraction produces no effect when the deviation is due to divergence excess. Since, as has already been pointed out, divergence excess constitutes by far the greater number of these cases, it follows, then, that most cases of divergent strabismus necessitate operative measures and not refraction for their cure. In fact, many cases of pure divergence excess will have little or no refractive error at all. The results of operative measures are exceedingly satisfactory, if we are guided in our choice of operation by the muscular anomaly present. The surgeon who makes it his practice to employ in all cases the same operative procedure is certain to meet with a greater number of failures than he who varies his method to accord with the muscular error he is called upon to attack. In the case of divergence excess associated with bilateral hypermetropia, advancement of both interni will result in failure. The proper procedure consists in a free tenotomy of both externi, repeated if necessary, and this is no less true when, as is rarely the case, the divergence excess is accompanied by bilateral myopia. In the hypermetropic cases, even if a fairly wellmarked convergence insufficiency coexists, the tenotomy still should constitute the primary measure, and should be persisted in until the deviation is corrected for distant vision. When bilateral fixation for distant objects has been thus obtained, it will not infrequently be found that the power of convergence has returned to normal and that further interference will be unnecessary. Cases of

myopia, associated with convergence insufficiency, in which the deviation persists after full correction of the myopia, require advancement of one, or more generally of both, interni, and in no circumstances should tenotomy of the externi be performed in pure cases of this type. When both divergence excess and convergence insufficiency in marked degree are associated, the predominating muscular error, which, except in cases of bilateral myopia, is usually the divergence excess, should be first attacked by means of free tenotomies of the externi.

Tonic Spasm of the Eyes in Conjugate Deviation. The emotional instability of some cases showing disorders of the basal ganglia has led frequently to their being regarded as hysterical, and this view has very naturally been taken of the symptom described by Mary R. Barkas.[4] This is the spasmodic conjugate deviation of the eyes upwards, usually to one side, accompanied by subjective distress and acute depressions.

The first case in which this symptom was noticed was one of progressive lenticular degeneration: the patient had been recommended for admission as hysterical, but when seen was recognized to be suffering from an organic disease of the Parkinson type. She was childish and emotional, subject to spasmodic laughing and crying, and began to complain that her "eyes got fixed," this being associated with great distress. At first this occurred rarely and lasted for only a few moments, but it has become more frequent and the attacks will last for any time up to about an hour. She can always move the eyes voluntarily, but this requires an effort, and they return when the effort is relaxed to the fixed position of conjugate deviation upwards and to the left. There is no nystagmus at any time in this patient and she has never had diplopia. Visual fields are normal.

(4) Lancet, Aug. 14, 1926.

The second case was sent from an infirmary, where she had been taken on account of threats of suicide, as she was depressed about the "fixing" of her eyes and thought this made her conspicuous. This had been her first symptom, beginning about a year ago, and she had noticed that emotional stress, such as anxiety about her husband, brought on the attacks. In these her eyes move up and to the left, become fixed, can be brought down by volitional effort, but soon return to the position of spasm. There is nystagmus on looking to the right, and she has had diplopia when reading, possibly due to refractive error and neglect to wear her glasses. Visual fields are normal. Later she developed spasmodic torticollis, independent of the eye symptom, and weakness and tremor of the right arm of the Parkinson type. She denies having ever seen anyone previously with similar symptoms.

The third case was a young man who complained that his eyes turned up and become fixed on Mondays: he was a bank clerk. Further investigation showed ankle clonus on one side, and a history of encephalitis lethargica was elicited, with transient diplopia. The eye symptom was associated with depression.

Since seeing these cases reference to the literature has discovered a paper by Marinesco and Radovici in which the conjugate deviation of the head and eyes in paroxysmal hypertonic attacks is described in three cases of post-encephalitic Parkinsonism; they suggest that these are due to some factor in the basal ganglia which is either not functioning normally or is not controlled normally by the cortex. In the cases here described the deviation of the eyes occurs alone, the head remaining in the flexed Parkinson posture in one case, while in the other a spasmodic torticollis occurs, but at separate times and under different circumstances from the eye symptom. Since the symptom is of a kind likely to be disregarded or considered hysterical, it seems worth while to draw attention to it as

being, in some cases at least, an early manifestation of a serious and progressive organic disease. Its constant association with spasmodic attacks of depression or weeping affords further evidence of the close relation between the basal ganglia and the emotions, and tempts one to speculate as to the possible organic basis through which the emotions may produce physical manifestations in hysteria.

Nystagmus. It is the purpose of this article by Edwin B. Dunphy,[5] to classify briefly the various types of nystagmus and in particular to review the causes of nystagmus due to ocular lesions.

Definition.—Nystagmus consists of a series of rapid, short, to and fro movements of the eyeballs, probably due, generally speaking, to some perversion of the centres governing the ocular movements. Both eyes are usually affected and to about the same degree. The usual type is horizontal. The oscillations occur 1 to 3 a second and are about 1 to 4 mm in length.

A few words about the mechanism of nystagmus: The static labyrinths are the essential organs of equilibration. Movement of the endolymph in the semicircular canals sends forth impulses which travel to the cerebellum, cerebrum and oculomotor nuclei. The nerve pathway from the horizontal canal goes over the vestibular nerve to Deiter's nucleus and thence through the posterior longitudinal bundle to the nuclei of the third, fourth and sixth nerves which control the eye muscles. The pathway from the vertical canals is over the vestibular nerve to upper portion of medulla, upward in the pons to level of middle cerebellar peduncles where fibers enter the posterior longitudinal bundle and go to the third, fourth and sixth nuclei.

There are two distinct types of nystagmus, the pathology being quite different in each: (1) Springing nystagmus; (2) Undulatory nystagmus. The former is characteristic of vestibular stimulation. There is a

(5) Boston M. & S. J., Mar. 25, 1926.

slow movement of the eyes one way (vestibular) followed by a quick return of the eyes to the original position (cerebral). This type is seen in suppuration of the labyrinth and also can be artificially produced in normal subjects by the Caloric and Barany tests. It is frequently seen in cerebellar abscess, tumors of the cerebellar-pontine angle and practically always in tumors of the cerebellum itself. It occurs in Friedrich's ataxia and multiple sclerosis, less often in encephalitis and syringomyelia. It is not unusual to observe it in Little's disease and in idiocy.

Undulatory nystagmus is, as the name implies, a slow, uneven affair without any rapid component. It comes from the constant effort of the eyes to get the image on the macula in spite of optical defects. The tonic association centres receive an abnormal stimulus due to inability of accurate fixation. The eyes tremble and deviate but the rhythmic centres, abnormally stimulated, come into play and a nystagmus of the undulatory type results. This is the type seen in cases of ocular origin.

Although opacities of the cornea and media are spoken of in all textbooks as chief causes of nystagmus, it is a well known fact that only a very small percentage of such cases have nystagmus even when the opacity has been present for years. On the other hand, nystagmus of the undulatory type is found usually in these cases of corneal and medial opacities. This would seem to indicate that the cause of the nystagmus is elsewhere, the corneal opacity being a mere incident, or at the most only a contributory factor.

The fact that in diseases of the anterior part of the eye, the posterior part is also often affected and the relative inability to study the fundi in these nystagmus cases, would lead us to the conclusion that the uveal tract is involved much more frequently than we can see, and that nystagmus is due chiefly to poor central vision.

Albinos present the classical picture of undulatory nystagmus. The eyes of these patients usually appear photophobic and show large refractive errors, frequently myopia and astigmatism. They all have nystagmus. The pathology of this condition consists of an absence of physiological pigment and it has been assumed therefore that the nystagmus occurs from a desire to escape light. Closer investigation however leads us to a different viewpoint: that the nystagmus may be due to faulty development of the macula and a consequent effort to establish central fixation.

Miner's nystagmus is an interesting affection prevalent among miners of certain sections of England. thought to be due to constant eyestrain under poor illumination. The movements of the two eyes are often entirely different. Rotary nystagmus is the most common, but horizontal and disjunctive movements are often seen. There is also a general involvement of the cerebral centers shown by headache, vertigo, photophobia, muscle tremors. Fergus has observed a rapid weak pulse, frequently intermittent, which cannot depend upon eyestrain alone.

It is known that the cones of the macular region are chiefly concerned with central vision in good illumination, losing their function in the dark. In semi-darkness the rods in the peripheral portion of the retina function most efficiently and the best vision in this condition of illumination is obtained through the peripheral parts of the retina. The illumination in many English mines has been very poor. Ninety per cent. of the light falling upon the coal face is absorbed and the amount of light entering the eye is sometimes as low as 1/500 of a foot candle. (An illumination of 4 foot candles is considered necessary for a seamstress.) Under such conditions there must be no central vision to speak of and the constant effort over a long period of time will give rise to undulatory movements.

There are some who believe a large neurotic element

enters into the disease; others have advanced the theory of a micro-organism. The condition is known in the mines of America, South Africa, and some parts of England and Scotland.

There is a type of nystagmus which belongs neither in the ocular nor vestibular class. This is the hereditary type which exists without any gross pathological lesion demonstrable. It has been seen in certain families for three or four generations, sometimes affecting males only and in other cases, females.

Many unusual types of nystagmus have been reported. Verhoeff gives the following explanation of a case of unilateral nystagmus with squint: At first there is a cortical lesion probably congenital in origin which tends to produce nystagmus of both eyes. This is associated with but independent of an absence of binocular vision which leads to squint. Owing to the fact that one eye is used for fixation its tendency toward nystagmus is fully compensated for. On the other hand, the squinting eye never being used for fixation, its tendency toward nystagmus is allowed to become manifest.

Paton reports a case of a man who could produce nystagmus of the springing type voluntarily, doing it much better in bright daylight than in twilight. The vision was 20/20 in each eye and no pathology could be found.

Hird reports the case of a boy, aged 10 years, with normal vision who showed a slight lateral springing nystagmus with both eyes open. When one eye was closed the nystagmus of the other eye greatly increased with a corresponding decrease in visual acuity to 6/60.

Runge studied 34 cases of alcoholism and found that nystagmus and incomplete ocular paresis can occur after consumption of large quantities of alcohol.

Other toxic agents have been known to produce nystagmus temporarily, such as chloroform, veronal, ar-

senic, lead, quinin, ergot and carbon di-sulphid. This is the springing type due to central action.

Occupational nystagmus, other than miner's nystagmus, has been observed in workers who are in the habit of watching fast moving machinery. Also among people who have to use their eyes in a constrained position under defective illumination, such as compositors.

The Conjunctiva

The Symptoms and Prognosis of Conjunctivitis. Conjunctivitis of various forms is generally considered to be a purely local disease, confined to the organ of sight, and causing no constitutional derangements and no mortality.

On the contrary, Stephenson says of diphtheria conjunctivitis, which is so rare in this country, but common in the South of France and the North of Germany and occasionally in England, "Fever, alimentary derangements and nervous phenomena are usual constitutional disturbances and the disease may be followed by loss of knee jerk and paresis of various parts of the body. Albumin may be present in the urine and occasionally diphtheretic conjunctivitis proves to be fatal."

Fuchs says "The general condition of the little patients is very much disturbed. They have high fever and are greatly prostrated. Weakly children not infrequently succumb to the severity of this disease. The prognosis, therefore, in the severe cases is very serious not only as regards the eye but also with respect to life itself."

As a focus of infection, the eye occasionally plays a part. DeSchweinitz says that arthritis, endocarditis and septicemia are sometimes complications of gonorrheal conjunctivitis and that rhinitis, infection of the lacrimal gland, meningitis and endocarditis have been

reported as complications of ophthalmia neonatorum.

Death or general morbidity, while a recognized possibility, is with us a medical rarity. Our greatest practical concern is to save the cornea. If the cornea can be left intact, conjunctivitis at its worst can only cause discomfort.

Walter Dean[6] describes some of the more common forms of conjunctivitis.

Beginning with acute catarrhal conjunctivitis we find objectively that the lids are slightly swollen, the conjunctiva of lids injected and smooth, flakes of mucus swimming in increased lacrymal secretion. Sometimes small hemorrhages are produced by the rupture of small vessels. The subjective symptoms consist of photophobia and of itching and burning of the eyes. A very troublesome sensation frequently present is that of a foreign body in the eye caused by flakes and filaments of tough mucus in the conjunctival sac. If such filaments lie upon the cornea they produce disturbance of sight. It is a characteristic feature of catarrh that its disagreeable symptoms are least marked in the morning and gradually increase until they reach their highest pitch in the evening. The prognosis is favorable except in severe infections when the so-called catarrhal ulcers form around the corneal margin. Most cases get well in one or two weeks. A few lapse into chronic catarrhal conjunctivitis.

In chronic catarrhal conjunctivitis the conjunctiva of the lids is red and velvety, the secretion is but slightly altered and slightly increased. The skin at the outer angle of the lids is sometimes excoriated. The lids itch, burn, smart and feel dry as though a foreign body were imbedded in the upper lid. Close work is difficult as the eyes soon tire and feel sleepy and close. Symptoms are again worse at night.

Fuchs makes this interesting comment "We see the conjunctiva quite intensely reddened in many people

(6) Kentucky M. J., December, 1925.

without their complaining in the least: while in others who do nothing but annoy the physician with their expressions of discomfort, there are often scarcely any changes perceptible in the conjunctiva." The prognosis is good as regards sight as ulcers are infrequent. In elderly people the so-called senile catarrh is not infrequent. Among its most frequent complications is inflammation of the edges of lids due to excessive tearing, eczema follows and pulls the lid downward and away from the eye.

Follicular conjunctivitis is a disease of children of the school age. It is often confused with trachoma on account of the precence of follicles. The objective symptom of follicles is often the only symptom present. Fuchs says "In many school children the disease exists in a perfectly latent form, as in spite of there being a considerable number of follicles, the conjunctiva is not reddened and causes no symptoms of any kind, so that the trouble is discovered only by medical examination. The follicles often persist for years. If an acute catarrhal conjunctivitis supervenes, the condition is more obstinate to cure than a catarrhal ophthalmia uncomplicated by follicles."

The prognosis is altogether good as the disease leads to no complications and leaves no permanent changes whatever, in this being opposed to trachoma which it otherwise somewhat resembles.

Our most hopelessly chronic conjunctivitis is trachoma. The patients complain of sensitiveness to light, of lacrymation, of sticking together of the lids, of pain and of visual disturbances. The eyes are partially closed, partly on account of photophobia, partly because the lid droops. The lid droops because it is heavy, thick and swollen and probably because there is a paralysis of the tarsal muscle. The mucous membrane of the lids is hypertrophied showing either papillae or trachoma granules or both. In recent cases and in exacerbations there is a purulent secretion. In

older cases the secretion is scant. As the condition progresses hypertrophy gives away to atrophy and the cicatricial stage is reached. In this way the trachoma is cured, but the lids and sometimes the cornea are left wrecked.

The prognosis is, of course, bad. Sight is usually markedly decreased by pannus and ulcerations, both leading to opacity of the cornea. Distortion of the lids with turning in the eyelashes leads to endless discomfort and pain. In a small percentage of cases the disease has been well established a long time before there are any subjective symptoms, and rarely we find a case having the characteristic scars of trachoma without the patient remembering that he ever had any trouble with his eyes. To one of these, we will find many blind and half blind patients. Trachoma is essentially a chronic disease. In no stage can it be dismissed as cured in any true sense.

Ophthalmia neonatorum is a group term embracing the various purulent inflammations of the conjunctiva in the new-born. They do not constitute an etiological unit, being produced by a variety of morbid germs. The purulent discharge usually shows the second or third. rarely the fourth or fifth day. Both eyes are usually involved. The lids are swollen, but soft and the cornea can be easily seen. Corneal ulcers are not so frequent as in gonorrheal conjunctivitis of adults. Therefore, the prognosis is fair or grave depending on early and proper treatment and the etiologic organism. If there is a hard wall of conjunctival swelling around the cornea, we know that the organism is virulent, that the cornea will suffer from lack of nutrition due to poor supply of lymph, and that the pus will macerate the corneal epithelium and that an ulcer will probably develop. If an ulcer develops we will probably see the cornea perforate later with or without destruction of the eye. Central ulcers which do not perforate make scars over the pupil and these, of course, reduce vision.

Gonorrheal conjunctivitis has an incubation period of from twelve hours to three days. The symptoms are similar to those of ophthalmia neonatorum except they are exaggerated. The lids are often swollen to such an extent that the physician has difficulty in opening them far enough to inspect the cornea. There is great cellular infiltration of the palpebral and bulbar conjunctiva. A raised wall of edematous conjunctiva is seen around the cornea. The initial secretion is like meat-juice. The pre-auricular gland is swollen, the patient has fever, is sick and in pain. Succeeding this stage of infiltration, pus proceeds to flow copiously and the infiltration begins to subside. This purulent stage lasts four to six weeks when the condition subsides or proceeds to chronic blennorrhea, which lasts a few weeks longer. After the violent inflammation has subsided the conjunctiva may return to normal or there may be slight cicatrices of the extra corneal conjunctiva They are of no consequence. The prognosis is always grave because the cornea may be lost by an annular abscess, or the cornea may perforate leading to panophthalmitis, or cicatrices with incarceration of the iris or dense opacity over the pupil.

In phlyctenular conjunctivitis photophobia is marked when the cornea is involved, slight in conjunctival cases. If a corneal ulcer is present, there is considerable spasm of the lids, and the child hides under the bedclothes and refuses to be moved. There may be one or more phlyctens. The intervening conjunctiva is normal. There is no infection primarily and no discharge. The disease is due to a dyscrasia, the lesion is a tiny accumulation of leukocytes. Softening begins at the apex and liquefaction takes place. Then infection occurs, which is only of consequence if the ulcer is on the cornea.

[It is not improbable that before many years the different varieties of conjunctivitis will be designated by

their laboratory findings, rather than from their clinical manifestations.—Ed.]

Corneal Complications. With regard to the complications of conjunctivitis, G. C. Hall[7] states that ulceration of the cornea is probably the most frequent and unquestionably the most serious. Its advent is usually accompanied by definite and well marked symptoms, chief of which are increase of the pain, photophobia and lacrimation.

Physical signs manifest are contraction of the pupil and change in the character of the injection. The former discomfort and grittiness become a sharply positive pain, either intense in character requiring sedatives or a dull heavy ache radiating over the head on the affected side. Photophobia is markedly increased, the patient shunning the light, squeezing the lids tightly against efforts at inspection or burying the face in the pillows. Lacrimation is likewise increased out of proportion to the former discharge.

Contraction of the pupil is marked as a result of the irritation of the corneal nerves or due to the irritation or acual involvement of the iris in the inflammatory process. The character of the injection changes and becomes ciliary in type, that is while the conjunctival injection may retain its previous intensity the circumcorneal area, previously but little affected, now becomes involved assuming a brickdust or even violaceous hue. Early recognition of the ulcer with prompt and intelligent efforts directed to its relief materially affect the prognosis.

Treatment of Conjunctivitis. The treatment of the various forms of conjunctivitis is discussed by A. L. Bass.[8]

Acute catarrhal conjunctivitis, or acute infective conjunctivitis, which is the title most usually applied to the infection caused by the Koch-Weeks bacillus, is

(7) Kentucky M. J., December, 1925.
(8) Ibid.

easily recognized; should be treated by the local application of Ag No_3 1 to 3 per cent. solution daily or every other day, in the office; at home warm normal saline compresses 10 to 20 minutes, followed by the instillation of a 10 to 20 per cent. solution of argyrol, silvol, or neosilvol three times per day.

Pneumococcus infection of the conjunctiva is treated satisfactorily with the treatment just outlined above, or the use of warm normal saline compresses for 10 minutes every two to four hours followed by the instillation of a 2 per cent. optochin solution is very effective.

Where there is a redness at the angle of the conjunctiva and the inflammation is less severe, which is indicative of Morax-Axenfeld bacillus presence, the use of warm normal saline compresses followed by the instillation of a $^1/_2$ per cent. Zn So_4 solution daily usually suffices.

Diphtheretic conjunctivitis is best treated by the adminstration of diphtheria antitoxin; local application of 1 to 2 per cent. solution of Ag No_3 daily together with the warm saline compresses 10 to 20 minutes, followed by argyrol, silvol and neo-silvol three times per day.

When the acute stage has subsided, in the above mentioned types, the mild antiseptics are sufficient; such as argyrol, silvol, neo-silvol in from 10 to 20 per cent. solution. For the sticky lids at night it is well to use some mild ointment, such as the yellow oxide of mercury 1 per cent. or the M. E. S., No. 3, on the lower lid, and have the patient rub gently for a few moments. This as well as the antiseptic drops, is to be preceded by the warm saline compresses for five or ten minutes.

In chronic catarrhal conjunctivitis the treatment is to remove all factors which may pertain to the condition as much as possible, such as improving the general condition under which the patient lives; diet, cleanliness, and so forth. Correct refractive errors, if any. The medical treatment at first is Ag No_3 1 to 2 per

cent. solution locally, and the patient is to use warm saline applications at home followed by astringent agents, such as Zn So_4 ½ to 1 per cent. solution, alum or tannin 1 per cent. solution; argyrol, silvol, neo-silvol 10 to 20 per cent. solution. The order in which the remedies are mentioned is their relative graduation as astringents from the strongest to the mildest. Ointments are of value, such as the copper citrate 5 per cent. or the M. E. S. No. 3.

Folliculosis: if there are no inflammatory symptoms, little or no treatment is necessary. Zn So_4 ½ per cent. solution or the Cu So_4 ointment ½ per cent. may be indicated. If there be active inflammatory condition present, the local application of Ag No_3 1 to 2 per cent. solution by the physician is indicated in conjunction with the use of of the astringents at home.

Trachomatous conjunctivitis, treatment of which has a two-fold object; one to do away with the inflammatory complications and increased secretions; the other to prevent conjunctival hypertrophy. The two chief remedies are Ag No.$_3$ and Cu So_4. To stay the inflammation and increased secretion, Ag No_3 is used in 1 to 2 per cent. solution or the actual stick. For the hypertrophied conjunctiva and where the inflammation and secretion is slight, Cu So_4 is the remedy of choice. Operative treatment is indicated where the granulations are large and especially in the retrotarsal fold. The operation of choice is the expression operation as done by McMullen of the U. S. P. H. Service, which produces the least harm to the conjunctiva with the maximum of benefit.

Tuberculous conjunctivitis usually occurs in the young and affects one eye as a rule. Treatment consists in excising or curetting the ulcer, and the local use of a 10 per cent. iodoform ointment. The general health is very important.

In addition to our medical treatment of conjunctival affections we must not forget the general hygienic

rules, such as having the patients keep the eye clean with warm saline flushings, avoid smoke, dust, "movies" and bad air in general, and advising them to pass their time in the open. They should refrain from using their eyes too much, especially in the evening by artificial light. As a prophylaxis against spreading the disease by contagious or infectious route, the patient must not use the same towels, wash basins, and the like, as other people. On the contrary, have patient use his own towel and wash basin, and the nurse, mother or any one administering treatment should use antiseptics on their hands before and after treatment.

Conjunctivitis as the result of injuries, such as foreign bodies and burns from caustics, is best treated according to the needs of the individual case and require experienced judgment in a great many instances. As a general rule, remove the cause first. If it be due to a foreign body or any caustic substance if there is any present, try to prevent any infection if none has occurred and treat the condition is a conservative way, give nature a chance and it is surprising at times what she will do.

[The one criticism I can offer in this excellent symposium, is to disagree with the author in the use of "warm saline flushings." In any of the varieties of catarrhal conjunctivitis, warm applications, whether of water alone or saline solutions, tend to favor the growth of bacteria. My own procedure is to advise either very hot or very cold fomentations, never lukewarm. In most cases, cold is more acceptable to the patient.—Ed.]

Conjunctivitis Tularensis. A case of conjunctivitis tularensis, which is the second case observed in the state of Georgia, is reported by Sach W. Jackson.[9]

A lad, aged 18, went rabbit hunting, killing several rabbits, which he cleaned. Soon afterward his left eye

(9) J. A. M. A., July 10, 1926.

became inflamed. The eye presented the picture of an acute purulent conjunctivitis. The usual treatment failed to give relief. Smears and cultures were negative. Blood examination gave a positive agglutination for *Bacterium tularense*. A Wassermann test from the same specimen of blood was negative. The case was especially interesting because of the absence of constitutional manifestations. They have always been present in the fourteen other eye cases of this sort now on record. The last treatment given was a 1 per cent. solution of mercurochrome-220 soluble to be instilled into the eye several times daily. The conjunctival infection gradually subsided.

Trachoma

The Surgery of Trachoma. The surgery of trachoma usually begins where the acute infectious process leaves off. We are, therefore, most interested in the transition stages that lie within the borderland of chronic conjunctivitis.

Without considering the etiology of trachoma, S. L. Ziegler[1] gives a brief review of the lesions that cause its persistence. These are purely mechanical. The two chief factors in this pathogenic dysfunction are (1) blepharophimosis and (2) lacrimal obstruction.

1. *Blepharophimosis.*—In the early stages of trachoma blepharophimosis is caused by the acute swelling engendered by the hypertrophied papillae, the gelatinoid granulations and the engorged mucosa. In the later stages, cicatricial contraction of the conjunctiva, of the tarsal cartilage and, indeed, of the total lid structure add to the complications of our problem. The ensuing entropion with trichiasis and the consequent lid friction result in multiple erosion ulcers, or in pannus, strictly limited to the area of pressure contact covered by the superior palpebrum and visibly demonstrated by the typical line of demarcation that forms

(1) J. A. M. A., Feb. 6, 1926.

across the horizontal meridian of the cornea where it divides the pannus from the clear cornea. These corneal lesions will automatically disappear whenever the lid tension is properly relieved.

2. *Lacrimal Obstruction.*—It is not generally held in mind that the trachomatous progress usually invades the mucous lining of the lacrimal canal and causes occlusion of its lumen, accompanied by either simple epiphora or the more dangerous regurgitation of septic secretions. To this may be added the infectious conjunctival discharge and the hypersecretion of tears from the reflex irritation of the lacrimal gland. This excess of moisture, especially if acrid or septic in character, in turn stimulates the growth of polypoid granulation on the conjunctival surface, and adds to the maceration that generally follows the corneal erosion engendered by lid friction. Nothing is more destructive than a tear-soaked mucosa. In fact, many trachoma operations that fail would have proved successful if the lacrimal lesions had been eliminated, their failure being wholly due to the excess of moisture that was persistently maintained.

Bearing all these facts in mind, the practical problems in the surgery of trachoma narrow themselves down to the correction of two abnormal physical conditions (1) lid friction and (2) lacrimal maceration.

The conservative surgery of trachoma:

1. *Knapp's Roller Operation.*—The upper lid should be everted, the granulations lightly scarified, and the tarsal cartilage compressed by strong roller forceps drawn obliquely downward with firm pressure (Plate III). This oblique direction of the movement makes easy the stripping out of the gelatinoid contents of the granulations without stretching too hard the retrotarsal fold. It should be repeated until the conjunctival surface is freed from granulations but corrugated by the mangles. If any granulations at the lower margin escape, they can be individually crushed. If by chance

a few are overlooked, they can be frozen subsequently with a pencil of carbon dioxid snow. The prior introduction of the author's bident lid clamp (Pl. X) will increase the efficiency of the Knapp roller forceps by furnishing a solid support for the mangles to roll over. Ice pads may be applied according to indications.

2. *Freezing with Carbon Dioxid Snow.*—To remove the turgesence of the conjunctiva, nothing is so efficient as an application of carbon dioxid snow. It has a remarkable action in destroying superficial pathologic new growth by causing rapid interstitial sclerosis. Like galvanocautery puncture and desiccation, it happily leaves behind a nicely rehabilitated mucous surface without any tendency to the production of dense, cicatricial tissue. The end-result is a beautiful, smooth conjunctiva.

Technic of Preparation.—The pencil of carbon dioxid snow is prepared as follows: A tank of carbon dioxid gas is procured from a pharmacy or other purveyor of soda water. When the tank is inclined obliquely (about 45 degrees) it will be found to contain sufficient liquid carbon dioxid to supply office needs for at least one year. The average commercial tank measures about 46 by 6 inches and costs three dollars and a half for the contained gas (the tank is returnable). It can be supported on the wall by a staple and a ring, or set up against the angle of the wall on a small wooden box. The nozzle should be turned downward and the valve cautiously opened. No attachment is necessary. A chamois or napkin may be held in the hand, compressed or hollow, with an ear speculum or a silver spoon placed in its center. The speculum will form a "pencil" of snow, and the spoon a "lozenge." The napkin is held near the nozzle but not too close, since the gas rushes out with some force, sputtering and often scattering the newly formed pencil of snow. The gas must not be allowed to blow on the fingers, or they will soon freeze. Silk gloves are a protection both in the forma-

tion and in the handling of the pencil. When enough snow has formed, it can either be kneaded in the napkin to harden or condense it; or, if already hard, it can be trimmed to the proper size with a knife. As the snow is quite dry, it crumbles easily. The pencil should be a trifle smaller than the area to be treated.

Technic of Application.—The pencil of carbon dioxid snow is applied by holding it on a given area for a duration of only three to five seconds. The whole area must be treated. If the pencil is not large enough to cover the whole area, it should be applied to successive sections; one should always be alert to remember both the area and the time limit. When the pencil has been removed, the area that was covered will present a whitish appearance and should remain quietly exposed for about 30 seconds to allow the surface to thaw out. The retrotarsal fold should be turned out with Darier's lid forceps. If the lower lid is involved, it should be drawn down and the surface frozen in the same way. If there is danger of dropping the snow on the cornea a Jaeger lid spatula should be slipped under the lid for protection.

As too long an exposure may cause sloughing, it will be necessary to judge of the vitality of the tissues before applying the snow. Sometimes the reaction is quite marked. If the rolling of the lids has not been recent, a mild scarification should first be made. For the after-treatment, ice pads are indicated as circumstances require. If, at the end of a week or ten days, inspection should reveal an area that has been overlooked, a smaller pencil of the carbon dioxid snow may be applied to this limited area. Occasionally, several applications are necessary in order to give the full effect. Although this is a simple procedure, experience and judgment are required for its proper execution.

3. *Canthotomy.*—The best procedure to relieve lid tension is cantholysis or section of the superior canthal ligament. The author began the surgery of trachoma

by first performing a free canthoplasty, then added cantholysis, and finally depended wholly on this section of the canthal ligament, which he performed subcutaneously, as it were. He found that this simpler procedure of canthotomy with cantholysis would yield almost as much lid freedom as the larger canthoplasty, and with much less deformity. Only three instruments are necessary: a speculum, a heavy rat-tooth fixation forceps, and a pair of small, sharp-pointed tenotomy scissors.

Technic of Canthotomy.—The corner of the upper lid is grasped by strong forceps at the external canthus, and traction made up and in to hold the canthal ligament tense (Pl. IV). With the small scissors, the angle of the external canthus is "nicked" and the sharp-pointed scissors pushed into this small wound until the tense canthal ligament is felt by stroking their points across it, just as one would feel for the optic nerve in performing an enucleation. As soon as one feels the ligament, one opens the scissors astride it and divides the ligament near its attachment to the bony margin of the orbit so as to avoid any injury to the lacrimal gland. The corner of the upper lid held by the forceps will jump up about a centimeter when the ligament is severed. If one does not get that sudden freedom of the upper lid, one has failed to divide the canthal ligament. If desired, the small wound may be closed with a single suture of No. 1 braided silk; but this is not always necessary. The benefits of canthotomy are notable because immediate improvement is observed and permanent good effects are maintained.

The inferior canthal ligament should never be divided except in cases of extreme cicatrical contraction of the inferior lid border, which is seldom observed. Such a section of the inferior ligament is liable to cause a lax ectropion that is difficult to correct.

4. *Canthoplasty.*—This free division of the canthus

was devised by von Ammon, and improved by Agnew, when he added cantholysis to the former's operation. Agnew, however, advised suturing the wound vertically instead of horizontally, which closed the wound again, so that the final effect was practically the same as that obtained with the simpler canthotomy. Where there is cicatricial contraction, slightly greater freedom will be secured from canthoplasty than from canthotomy. Von Ammon's technic is the one that is usually followed, but Agnew's addition of cantholysis yields a far superior result. Straight scissors are usually recommended, but a study of the facial expression after operation will prove convincing that the curved scissors with points directed upward will furnish a more pleasing effect, because they give the patient the appearance of smiling, while the straight scissors yield a sorrowful expression.

Technic of Canthoplasty.—The canthoplasty scissors are placed astride the external canthus, with curved blades directed upward and turned slightly outward so as to cut more of the skin surface than of the conjunctiva (Pl. V). The skin is unyielding but the conjunctiva usually stretches a little, or can easily be made to do so. The upper lid is then grasped by the strong forceps, the superior canthal ligament drawn taut (Pl. VI) and severed by the same technic as described under the procedure of canthotomy (Pl. VII). Three sutures of No. 1 braided silk are then inserted (VIII) to join the skin and conjunctiva together, the central one being entered first and tied so as to secure good apposition. Some omit the sutures; but this is unsurgical, since distortion and granulations may result. If the lacrimal gland is injured, a lacrimal cyst may follow, which is troublesome to relieve. Occasionally a small artery is severed that will require torsion or ligature.

5. *Rapid Dilation of the Lacrimal Canal.*—A patulous tear duct is most essential to drain off the acrid

lacrimal secretions and thus relieve corneal maceration by drying up the excessive moisture. It is better to avoid incision of the canaliculus because of the tendency to cicatricial contraction that is present in a xerotic conjunctiva. In some cases, however, Bowman's operation may be necesssary.

Technic of Rapid Dilation.—The small dilator (1.5 mm., or No. 6, same as needle-probe) is entered vertically into the punctum and passed horizontally through the canaliculus until its point rests solidly against the bony wall of the sac. It is then withdrawn and the large dilator (3 or 3.5 mm.) substituted, and passed through the canaliculus until the point rests against the bony canal. The shaft of the dilator is now raised to the vertical, half rotated with bayonet to the rear and forcibly passed backward, downward and forward through the duct until its point rests on the floor of the nose. It is then withdrawn.

Rapid dilation of the lacrimonasal canal retains the capillary action of the duct and so directs the current of lacrimal draining downward into the nose. The relief from lacrimal maceration will promptly be made evident.

6. *Galvanocautery Puncture for Entropion and Trichiasis.*—The ill effects of lid friction arising from incurvation of the tarsal cartilage, combined with trichiasis, are so manifest that the possibility of securing relief by so simple a procedure as galvanocautary puncture has proved to be a great boon. Many serious plastic operations that have been ingeniously devised to relieve these complications have been made wholly obsolete by the efficiency of this simple procedure. As the technic becomes more familiar by practice, many additional indications will be found for its application. It should always be remembered that a hot cautery point in the presence of ether will cause an explosion.

Technic of Galvanocautery Puncture.—The lid clamp is adjusted over the skin surface of the lid, with its

straight bar set parallel with the margin (Pl. IX). The galvanocautery point (Fig. 7) is applied to the skin surface with pressure, the current is turned on, and a quick thrust is made through the cartilage and the point as quickly withdrawn. The punctures are lo-

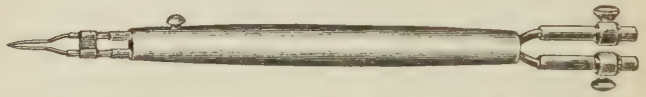


Fig. 7.—Galvanocautery handle and point for galvanocautery puncture operation in entropion (one-third reduction).

cated at intervals of 4 mm. and at the same distance from the lid margin. In ectropion, the same technic is executed on the conjunctival surface.

If preferred, the current can first be turned on to heat the cautery point and the punctures executed with a "free hand" by making them as "quick thrusts." Under no circumstances should slow punctures be made, since prolonged contact is dangerously destructive. The charred eschars may be removed, and solution of formaldehyd, U. S. P., in 1 per cent. dilution, applied to each puncture. If there is any reaction, ice pads should be used as needed. No dressing is required. The immediate effect is quite noticeable. Healing occurs in one week. The procedure can be repeated in two weeks if it is evident that the condition is not sufficiently corrected. The second set of punctures should alternate with the first set.

7. *Galvanocautery Peritomy for Pannus.*—When the pannus does not disappear automatically after correction of these lesions by the procedures described, there is indicated for its relief either the simple pericorneal incision known as peritomy, or the more radical excision of a strip of conjunctiva around the cornea known as peridectomy. The author prefers, however, to practice a different procedure, which he has designated as galvanocautery peritomy (Pl. IX). A series of deft touches with the galvanocautery point

are lightly made around the superior limbus until the precise area of vascularization is cut off. If there are dilated vessels on the cornea, they may also be touched along their course. Too deep a burn over the ciliary body may set up glaucoma, while H. Knapp has warned us that overheating of the aqueous may result in cataract.

The eschar may be carefully removed and solution of formaldehyd, U. S. P., 1 per cent., applied. No dressing is required, but mercuric chlorid ointment should be placed in the culdesac. Ice pads are indicated, according to circumstances. This is a most efficient procedure if properly performed. It is an emergency measure that is seldom required.

The radical surgery of trachoma:

As previously stated, two procedures are available for those cases that require more radical relief: Burow's operation of splitting the tarsal cartilage for the milder cases, while the extremely chronic cases that are beyond all hope of conservation should be cared for by the more radical Kuhnt-Heisrath excision of the tarsal cartilage. In fact, the first named procedure may be considered the primary stage of the latter. Whichever one of these measures is decided on, it should be preceded or supplemented by three of the conservative procedures previously described: canthotomy, galvanocautery puncture, and rapid dilation of the lacrimal canal. These should always be made a sine qua non in all operative procedures for the surgical relief of trachoma.

8. *Burow's Operation.*—This is quickly accomplished by fixing the upper lid with the bident lid clamp, making a small puncture of the tarsus near the ciliary margin with a Beer's knife (Pl. X) and executing a division of the cartilage along the gray line with strabismus scissors (Pl. XI). The scissors should hug the cartilage closely so that no other structures will be divided. By cutting first from the center

toward the inner canthus and then turning the cutting from the center toward the outer canthus, the incision is easily completed. A compress and bandage is usually applied for twenty-four hours. Occasionally a divided artery must be controlled, and sometimes a secondary hemorrhage will occur during the first night. This splitting of the tarsal cartilage by making a flail-like hinge of the upper lid will accomplish three things: (1) turn the margin of the lid outward, (2) relieve the trichiasis, and (3) add greatly to the lid freedom.

9. *Tarsectomy by the Kuhnt-Heisrath Method.*—Tarsectomy was first suggested by Heisrath (1882) and later improved by Kuhnt (1897).

Technic of Tarsectomy.—The splitting of the cartilage just described under Burow's operation may be accepted as the primary stage of tarsectomy (Plates X, XI). With the bident lid forceps retained in place, an incision is next made along the proximal border of the cartilage with the knife. This permits the insertion of three double armed mattress sutures of No. 2 black silk in the lower edge of the wound, with the loop of thread resting on the conjunctival surface (Pl. XII). The assistant makes traction on one or all of these threads as the surgeon grasps the ciliary edge of the cartilage with horseshoe forceps and turns it downward, while he uses the scissors as a blunt dissector, or chips away the pretarsal tissues until the cartilage is wholly excised and the retrotarsal fold dissected loose. The mattress sutures are now passed through the ciliary margin of the wound (Pl. XII) and drawn taut, after which the bident lid forceps are removed. The threads are then tied in good approximation, leaving exposed the horizontal loops of three mattress sutures (Fig. 8).

An alternate arrangement permits insertion of these sutures so that the exposed loops will rest vertically across the open wound, which makes better approxi-

mation. In this technic the needles are dipped into the conjunctival tissue parallel with each margin of the wound, and when the sutures are tied vertically across the wound they appear more typical of the mat-

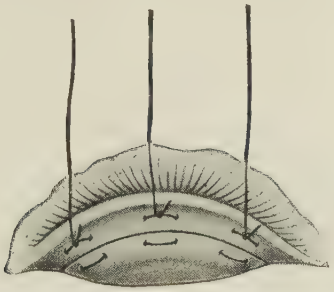


Fig. 8.—Horizontal mattress sutures tied; ends left long.

tress type (Fig. 9). In either case, one end of each suture is left long and the three ends are fastened together on the cheek by adhesive plaster. This facilitates the removal of the sutures on the fifth day, as

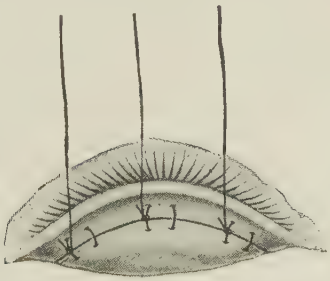


Fig. 9.—Vertical mattress sutures tied; ends left long.

they can be drawn down and clipped without disturbing the wound.

Since corneal ulceration has occasionally followed the pressure of the threads on the cornea, it will be the part of wisdom to insert mercuric chlorid ointment into the culdesac as a lubricant and antiseptic. If there is reaction, ice pads should be applied as needed.

Many serious deformities have been apprehended as the sequelae of tarsectomy, such as lagophthalmos or ptosis; but, if the technic is properly followed, no untoward result need be feared. Healing is usually uneventful, but the palpebral aperture will probably be a little wider, owing to the vertical shortening of the lid. Each advance in this operation has been in the direction of conservation of tissue. Hence an earnest effort should first be made to regenerate the retrotarsal fold by rolling and carbon dioxid snow before sacrificing it.

The Lacrimal Apparatus

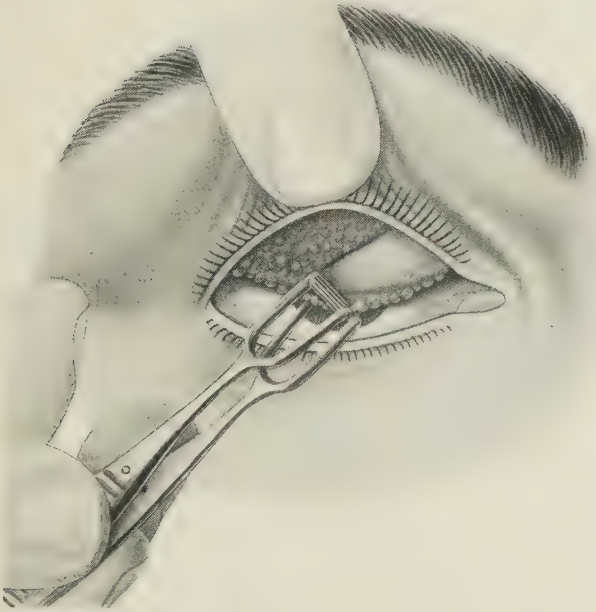
Epithelioma of the Lacrimal Sac. True neoplasms of the lacrimal sac are somewhat unusual. Many reported tumors are granulomatous or degenerative products of long standing inflammation, while others arise intrinsically from various elements in the sac wall.

The following cases of true epithelioma are noted in recent literature:

Guibert (in 1905), mentioned a limited epithelioma in which cure was effected by the roentgen ray, and following him Rollet and Lafon reported cases of primary epithelioma of the sac, the latter recurrent. Bistis reported a primary cancer in a man of 60, in which the sac wall became 1 cm. thick. Many of the cases reported have come from Italian clinics, and De Vincentiis, as long ago as 1877, pointed out the danger of confusion in diagnosis with ordinary thickening of the sac wall in a chronic dacryocystitis. Maggi, Pasettio, and Denti have contributed several cases. Hermann reports a hard papilloma of the sac. Juler discovered a similar good sized growth in the upper canaliculus. Posey's case was a primary epithelioma of the sac proper.

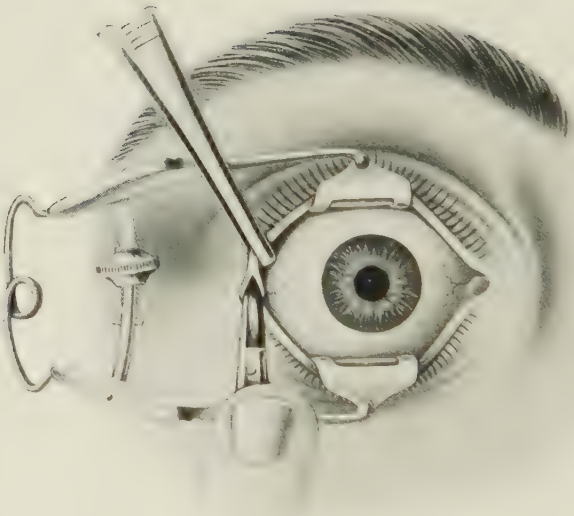
These cases were primary tumors, many being benign papillomas, filling the lumen of the sac, which

PLATE III.



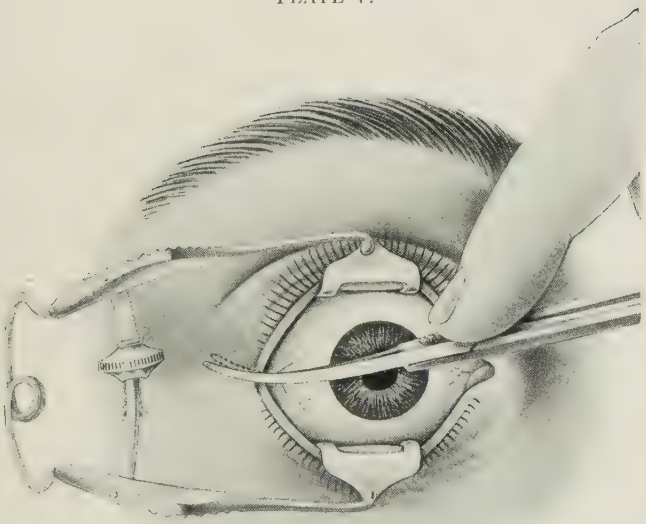
Knapp's roller operation for trachoma; oblique traction. Ziegler, page 85.

PLATE IV.



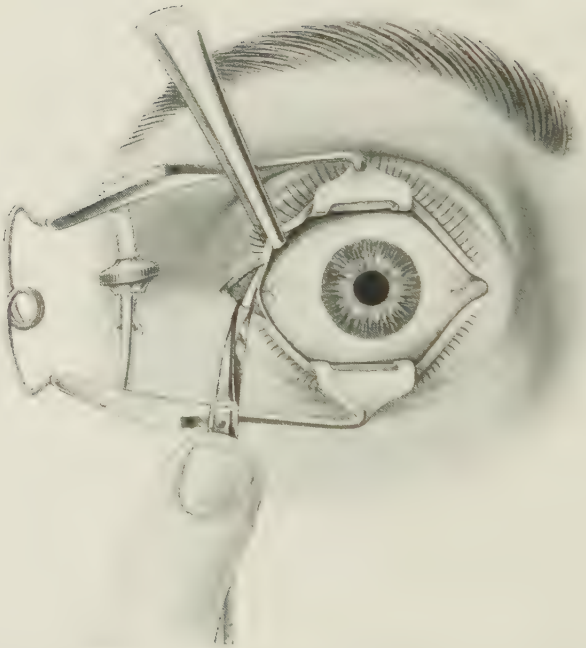
Canthotomy (Ziegler); external canthus "nicked" with small scissors; lid held tense with heavy forceps; superior canthal ligament severed (cantholysis); corner of lid should jump from 10 to 15 mm. when ligament is cut. Ziegler, page 85.

PLATE V.



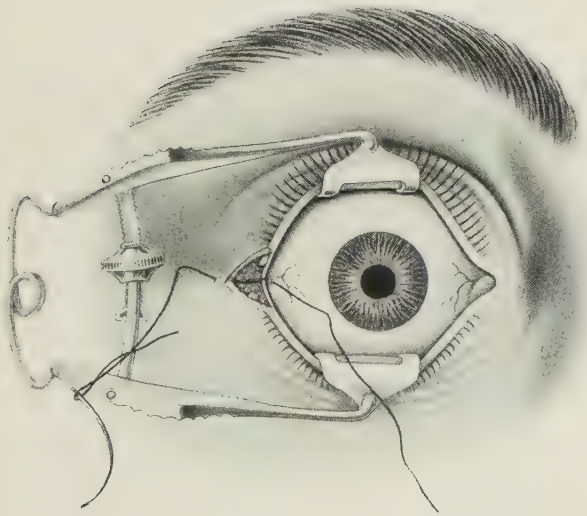
Canthoplasty (von Ammon-Agnew): canthoplasty scissors in position with curve directed upward and leaning more to skin surface.—Ziegler, page 85.

PLATE VI.



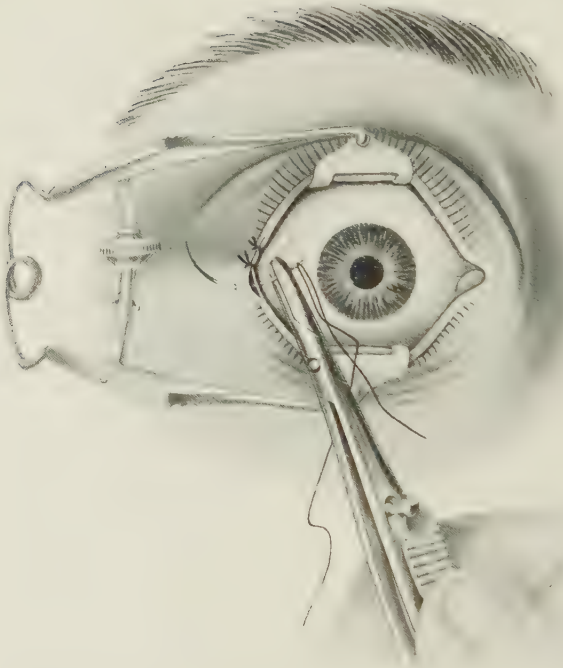
Canthoplasty: corner of lid held tense; tenotomy scissors astride superior canthal ligament (diagrammatic).—Ziegler, page 85.

PLATE VII.

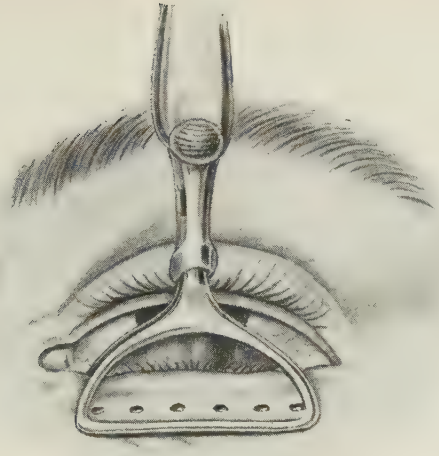


Canthoplasty: severed superior canthal ligament (cantholysis); central suture introduced.—Ziegler, page 85.

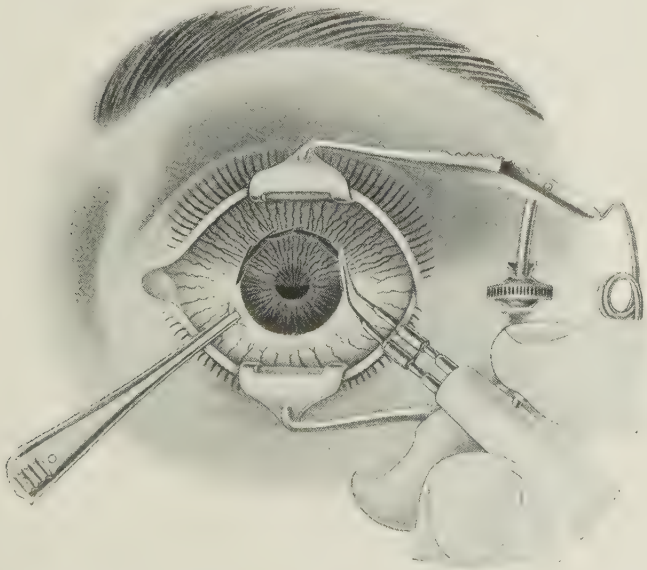
PLATE VIII.



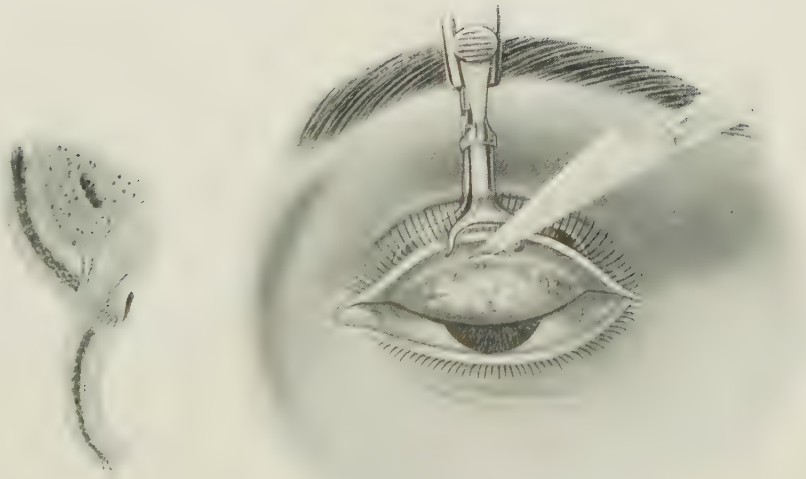
Cantholasty: two sutures tied and third being introduced. -Ziegler, page 85.



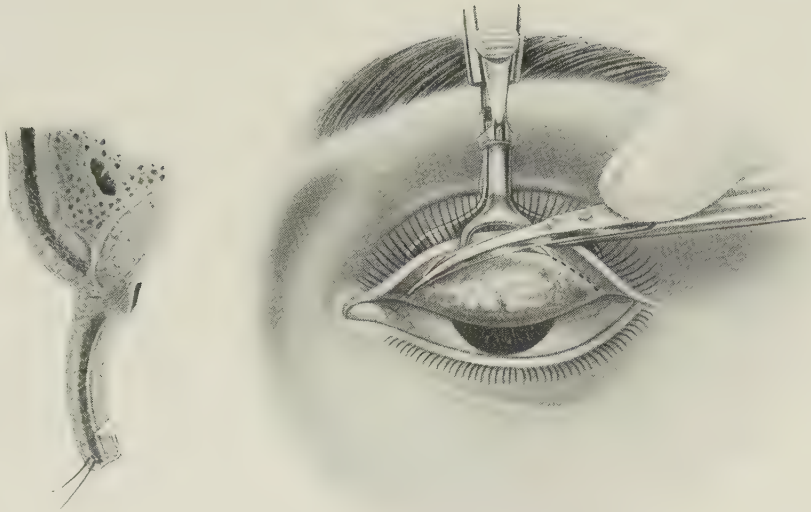
Galvanocautery puncture (Ziegler) for entropion and trichiasis: lid clamp adjusted; punctures on skin surface.



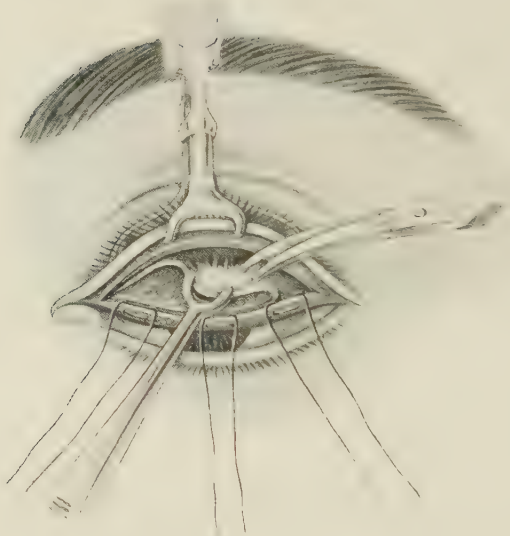
Ziegler's galvanocautery peritomy.—Ziegler, page 85.



Burow's operation: splitting the cartilage; puncture with Beer's knife; bident lid clamp (first stage, Kuhnt-Heisrath tarsectomy). Ziegler, page 85.



Burow's operation: dividing the cartilage with scissors (first stage, Kuhnt-Heisrath tarsectomy).—Ziegler, page 85.



Kuhnt-Heisrath tarsectomy: excision completed with scissors; horseshoe fixation forceps; mattress sutures inserted in proximal edge of wound.

Mattress sutures inserted in ciliary edge of wound.—Ziegler, page 85.

can readily be peeled away from the growth. A few cases showed extensive thickening of the wall, with heaping up of many layers of cylindric and cuboidal cells, readily distinguishable from the hyaline distention of the plasmoma reported by Verhoeff and Derby. The verrucous growths showed marked squamous cell

Fig. 10.—Black, extent of tumor; outer shaded area, limit of incision.

increase, with dipping in and karyokinetic exaggeration in those cases bordering on malignancy.

An element distinctly unusual enters into the case here reported by R. A. Fenton,[2] namely, the invasion of the normal lacrimal sac structures by a slowly grow-

Fig. 11.—Plastic operation for moving lids toward nose, reducing defect.

ing epithelioma of the nasal skin, under the stimulating influence of roentgen-ray irradiation. The pathologic diagnosis was squamous cell carcinoma, highly malignant.

Radical excision of the growth with as much neighboring skin and periosteum as possible was made, fol-

(2) J. A. M. A., Oct. 10, 1925.

lowed by two subsequent plastic operations. The final result is shown by the accompanying illustration. (Figs. 10, 11, 12, 13.)

The author concludes that epithelioma of the skin about the eye may be metamorphosed by stimulant

Fig. 12.—Plastic repair of upper lid defect with forehead flap.

doses of roentgen ray or radium into a type that will invade conjunctival and mucosal structures.

Irradiated papyraceous skin may give rise to epitheliomatous invasion of healthy skin flaps about the eye.

Fig. 13.—Results of plastic operation, three months after second operation.

at a point of suture or of contact with the moving globe. Such attack is probably activated by irritation

of granulation tissue by lacrimal secretion and by the bacterial flora of the skin and conjunctiva.

Radium and the roentgen ray must be used in sufficient strength to produce endarteritis and starvation changes, if employed at all on ocular neoplasms. It is regrettable that no opportunity was afforded for follow-up use of radium in this case.

Caution should be exercised in the selection of a physician for roentgenologic or radiologic treatment about the eye. Commercial exploitation of the sale of apparatus and of radium has brought about the installation of these powerful agents in the hands of physicians untrained in their use; or even into the control of lay technicians, or of so-called beauty specialists. The caution of such guesswork operators, in attempting radiotherapy, is often, as in this case, productive of stimulative changes rather than of destruction. Dermatology and ophthalmology must join hands in deciding methods of screening, distance, intensity and time limits for this valuable, yet highly dangerous agent.

The Cornea

Blood-Staining of the Cornea. When one considers the number of patients with severe eye injuries seen in ophthalmic practice, blood-staining of the cornea is a comparatively rare condition. According to Romer. it occurred in one case out of four hundred eye injuries, at the Geissen Clinic. At the Royal London Ophthalmic Clinic, it has been observed in about the same proportion. At the Vienna Clinic it has not been seen quite so often. Professor Fuchs states, regarding blood-staining of the cornea, that a peculiar sort of opacity and coloration (blood-staining) develops when the anterior chamber remains for some time filled with blood. Then the cornea, because it takes up the coloring matter of the blood, assumes an intense reddish.

brownish, or brownish-green color, and at the same time becomes so opaque that the parts can no longer be distinguished through it.

It gradually clears again, beginning at the edge, but only in rare cases becomes once more perfectly transparent, and then only after months or years have elapsed. In that stage in which the central brown portion is surrounded by a narrow marginal zone which has regained its transparency, it looks as if a brown crystalline lens had prolapsed the cornea (Vossius, Treacher Collins). With the slit-lamps, the staining appears to affect mainly the interlamellar spaces, in which the lamellae themselves, and along with the diffuse staining, granules and larger golden-yellow particles may be seen (Koeppe). In most cases, the microscope shows in the lamellae of the cornea highly refractive granules, and giving the same color reactions as the erythrocytes. In some cases granules of hemosiderin are found.

Seven years ago Charles Maghy[3] published the pathological findings from four cases of blood-staining of the cornea. Since then he has observed three additional cases, and has been able to secure the eyes for pathological examination. The results of these findings are given in detail.

Ulcers of the Cornea. Most ulcers of the cornea that come to us are caused by external violence, such as the implantation of a foreign body and its removal, or a glancing blow with the finger nail, a stick of wood, a piece of steel, or some implement, or the roughness of the lid causing friction and rubbing off of particles of the cornea. Others are of systemic origin, as in diabetes, malnutrition, tuberculosis, lues. Still others are caused locally by burns, caustics, bacterial invasion, and the like. The so-called simple ulcer we are most often asked to treat. The idea is to get such an ulcer healed with all possible haste, before bacterial infec-

(3) California & West. Med., May, 1926.

tion has time to take place, and to avoid scar formation at the site of the ulcer. A great many simple ulcers get well of their own accord, but the smallest ulcer should not be neglected and should be promptly dealt with.

Regarding the treatment of corneal ulcers, M. C. Baker[4] advises that primarily the patient should rest from all work, especially close work. Dark glasses should be worn over both eyes, and the practice not permitted of some patients removing the lens from over the good eye. The patient should avoid real bright light, but should be urged to take a certain amount of exercise and fresh air.

As a rule it is wise to put the iris and ciliary body at rest with 2 per cent. homatropin or 1 per cent. atropin solution. This is not always necessary or expedient and in rare cases is contraindicated, but whenever used the surest and quickest healing is obtained. Oftentimes the mydriatic is the only medication necessary as the ulcer then, if uncomplicated, has a tendency to heal rapidly. It is advisable, however, to have the patient use, in conjunction with the mydriatic, some silver salt such as argyrol for its germicidal effect, or zinc solution or yellow oxid of mercury ointment for the stimulating effect on corneal regeneration.

The profession is to be warned against the habit of some general practitioners of prescribing cocain solutions for the patient to use at home for the relief of his pain. The tendency of the cocain is to cause a dryness of the cornea, an inhibition of cell activity, a masking of valuable symptoms, and consequent harm rather than good.

A compressing bandage is oftentimes useful, particularly in perforating ulcers or those that have a tendency to perforate.

Hot compresses are a useful adjunct. They relieve pain and stimulate cell activity and regeneration.

Dionin in solutions varying from 1 to 10 per cent.

(4) Kentucky M. J., March, 1926.

has an unquestioned value. Besides its lymphagogue an analgesic action it seems at times to have a positive effect in stimulating corneal regeneration. Its best effect is obtained by using it periodically, for instance use three days and then omit for three days.

The author as a matter of routine instills one drop of adrenalin chlorid at each visit of the patient to the office and considers it of marked benefit.

As a rule if the ulcer be uncomplicated the cauterizing of the lesion with 1 per cent. silver nitrate in conjunction with the home treatment is sufficient to bring about healing.

If, in spite of such treatment, the ulcer continues to spread or deepen, the process must be stopped by one of three means. (1) Scraping with a curette; (2) direct application of a germicidal caustic; (3) the actual cautery. Before resorting to these means it should be discovered if there be any contributing conjunctivitis, roughness of the lids, trichiasis, or disease of the lacrimal apparatus. If so it should be properly dealt with, otherwise treatment of the ulcer alone will be in vain.

If curetting be resorted to the eye should be thoroughly cocainized, the ulcerated area curetted with a sharp spoon, all sloughed material removed, the edges cauterized, iodoform, aristol or powdered calomel dusted upon its surface, and a dry sterile compressing bandage applied.

The chemical agents employed for their cauterizing and germicidal effect are nitrate of silver, 1 to 5 per cent. strength, carbolic acid, nitric acid, trichloracetic acid, tincture of iodin and formaldehyd. The application should be confined to the ulcerated area, and to make sure of its extent it is advisable to stain the area with a solution of flourescein.

The actual cautery may consist of a Paguelin or galvano-cautery, or a knitting needle or platinum probe heated red hot in the flame of a Bunsen burner.

The edge of the floor of the ulcer should be gently but thoroughly burned, a drop of atropin instilled and a bandage applied.

Ulcers showing bacterial invasion may be treated, in addition to local measures, with the use of vaccines and serums.

One of the most stubborn ulcers is the so-called pneumococcus ulcer. It is in this variety that ethylhydrocuprein or optochin has been of benefit. It is in this type of ulcer, too, that the use of the thermophore is of particular value.

Treatment of Corneal Ulcers With the Electro-Thermophore. In 1917-18 Shahan conducted a now classical series of animal experiments by means of applying heated copper-nickel plated cylinders directly

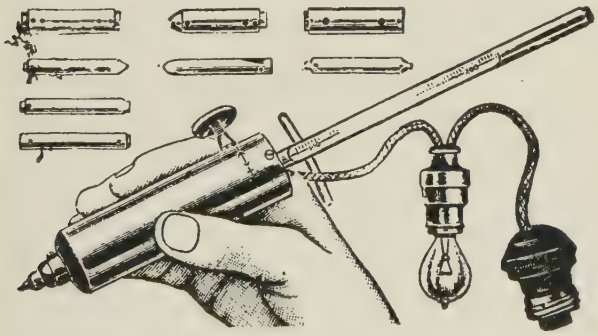


Fig. 14.—Electro-thermophore of Shahan.

to the cornea, to determine the physiological limit of heat tolerance. As a result of this work, the electro-thermophore of Shahan was elaborated.

With this instrument Shahan was able to demonstrate that the different tissues have different physiological limits to heat tolerance. In his earlier experiments a rather low degree of heat was used for a considerable time—10 minutes. The clinical results were, however, disappointing. It was demonstrated, though,

that the heat is not confined to the surface alone, but passes directly through the cornea so that the posterior corneal layer attains a constant temperature in one minute. He found that the corneal epithelium was destroyed by a continuous application of 130° for one minute, and that this was rapidly replaced, so that the area was completely covered in two or three days. Corneal tissues showed a slight clouding at 152° but 170° merely increased the depth and intensity of the resulting nebula without causing any necrotic changes leading to perforation. A temperature of 190° caused intense whitening of the substantia propria, followed in a few days with extensive vascularization, but no necrotic changes leading to perforation.

F. D. Phinney[5] reports three cases of infectious corneal ulcer in which this treatment was employed. All three cases gave positive cultures of pneumococcus, the thermophore was applied at 160° for one minute. None of the cases complained of postoperative pain. The pain of the ulcer was stopped or greatly diminished in all cases. Except in one case there was no further advancement of the ulcer. The hypopyon gradually diminished and disappeared in three or four days. The ulcers progressively filled in. In the third case the ulcer showed a tendency to advance. A second application was made four days later, and a third a week later, with satisfactory results. In none of these cases were they able to observe any destructive changes due to heat in the iris or the lens.

Dermoid Tumor of the Corneoconjunctiva. Dermoid tumors arising from the conjunctiva are not uncommon, and many cases have been reported in the literature. There are congenital defects which not infrequently are associated with other abnormalities of development, such as coloboma of the eyelids, cleft palate, harelip, and the like. The most frequent site of occurrence is in the lower, outer quadrant of the eye-

(5) Ohio State M. J., February, 1926.

ball, but they are also seen in the transition folds of the lids.

Many theories have been advanced in explanation of this type of abnormality, chief of which are Ryba's theory of incomplete closure of the lids, with cornification of the conjunctiva, Ramak's theory of fetal invagination of the external blastoderm, and the theory on VanDuyse that they are caused by adhesions of the amnion to the surface of the eyeball in a very early period of fetal life. Fuchs calls them islands of skin upon the surface of the eyeball. Mayou refers to this deformity as an aberration caused by sequestration of the portion of the surface epithelium along the line of the orbitonasal fissure and also as a failure of the eyelids to bud out in a whole or a portion of their extent. in this latter case also accounting for other defects such as cryptophthalmia and coloboma of the eyelids. Most textbooks of pathology classify dermoids as true teratomas, but Bland-Sutton refers to dermoids of the conjunctiva as conjunctival moles, as in the main they contain cuticular elements only. This would seem particularly applicable to a case reported by A. B. Dykman.[7] as numerous cutaneous moles were observed about the face and neck of the patient.

Examination revealed a circular, yellowish-white cone shaped tumor, 7 mm. in diameter at the base and 3 mm. high, astride the limbus in the lower temporal quadrant of the left eyeball. It was firmly attached to the cornea, but only penetrated the superficial layers and encroached upon it for a distance of 3 mm. There was a well marked semi-lunar opacity, 1 mm. wide, surrounding the corneal portion of the tumor. In its conjunctival attachment over the sclera, the mass was slightly movable. The tumor was soft, as if of fatty consistency, and could be pitted with a probe. Near the apex of the cone was a circular 2 mm. strip, containing many fine blood vessels. The center of the cone

(7) Northwest Med., April, 1926.

showed many papillae similar to the papillae of the skin and from which several fine brown hairs protruded. The vision of this eye, with a correction for a moderately high hyperopic astigmatism, was 5/6 partly.

The right eye showed a moderate degree of conical cornea, in which vision could not be improved beyond 5/20. Due to parental objections, operation for removal of the tumor was refused so that opportunity for histologic study was denied.

The Iris

Aniridia in Four Generations. A patient exhibiting this unusual and interesting anomaly is thus described by J. Brook Lewis:[8]

H. B., a male, aged 6 years, was brought to the outpatient department of the Adelaide Children's Hospital because of defective sight. He had double aniridia

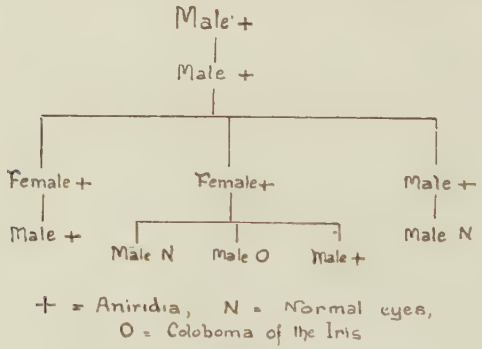


Figure 15.

and horizontal nystagmus. His refractive error was + 6 diopters in the right eye and + 7 in the left eye in both meridians. The mother who brought the child had double aniridia, vertical nystagmus and definite diffuse lens opacities in both eyes. The correction of

(8) M. J. Australia, May 1, 1926.

her glasses was + 1.75 spherical lens for the right eye and a one diopter + spherical lens for the left eye. The mother's father and grandfather were affected as were also a sister and brother. The family tree as far as could be ascertained is shown in the accompanying diagram. (Fig. 15.)

Of the two adult females examined one had had both lenses removed for cataract, the left with a disastrous result. The other female had diffuse opacities in both lenses. This is in accordance with what is usually found in cases of aniridia, the lenses suffering change at an early age. One child had coloboma of the iris, as if the absence of the cells in the embryo was in his case only partial. Another point was the absence of complaint. Only in bright light did they appreciate the disadvantage of their condition. Parsons states that the influence of heredity is seen in this abnormality more than in other ocular malformations. Thus Guthier found ten cases in four generations, Galazowski thirty-one cases in three generations, de Beck seven cases of aniridia and two of coloboma in three generations and Mohn found a mother with complete and two sons with partial aniridia.

The Significance of Certain Pathological Pupillary Changes. This is described by G. H. Hopkins.[9]

The pupil is an aperture in the iris which permits the passage of light rays through it, and by its contraction and dilation so controls the quantity of this light that we may get the best visual differentiation.

Normally it varies in size depending on conditions of life and of light. In infancy the pupils are contracted; in youth and adolescence somewhat dilated; in the middle years of life they occupy a position midway between these two states; while in old age they the usually somewhat contracted. Ordinarily in bright light they will be found contracted, while in dim light or darkness they will be dilated. As a general rule

(9) Colorado Med., December, 1925.

dark brown or deeply pigmented irides are associated with somewhat larger pupils than light gray or blue.

In considering the pupil anatomically we must of necessity consider the musculature of the iris which surrounds and makes it. The iris has in it two muscles one the pupillo-constrictor or sphincter muscle, the other the pupillo-dilator or radial muscle. The muscle fibers of the former are arranged circularly about the margin of the pupil, while the radiating fibers of the latter have their origin in the root of the iris and their insertion into the fibers of the sphincter. As their names imply, the action of each of these muscles is the direct opposite of the other.

The nerves supplying the iris consist of three different sets, namely: sensory, motor, and sympathetic.

From the fact that either the dilating or contracting musculature of the pupil may be affected, one can readily see that the dilation and contraction may be either of a spastic or paralytic type, depending on which nerve pathway is affected and in what manner. Normally contraction of the pupil is brought about by stimulation of the pupillary light reflex are either through its afferent arm consisting of the retina and optic nerve tract, or by downward impulses along its efferent arm originating from cerebral stimuli. Dilatation of the pupil is brought about by stimulation of the sympathetic nerves which in turn act on the dilator muscle, or by suspension of the pupillo-contracting mechanism in the brain.

In health both pupils are equal in size and readily responsive to light and accommodation. Any variation from this state is nearly always pathological, although it is not always possible to find the cause.

In order to appreciate fully the significance of various pupillary changes we must always keep in mind the various physiological and pathological states of the body which may influence its behavior. The normal pupil is influenced by the following conditions:

(1) light and shade, (2) sensory stimuli, (3) certain drugs, either locally or internally, (4) emotional states, (5) sleep, coma, death, (6) local diseases of the eye, (7) disease of central nervous system, (8) various other conditions in the body.

As mentioned above, light and shade normally cause a contraction or dilation of the pupil accordingly as they vary in intensity. Sensory stimuli, such as pressure on inflamed joints or similar stimuli elsewhere in the body, are apt to cause dilatation.

Drugs, either instilled locally in the eye or given internally, may cause either a contraction or a dilatation according to the individual selective action of the drug. Some, as for example, chloral, may even at first cause a contraction and later on, as the amount in the system increases, a dilatation. The more common drugs causing a contraction of the pupil are eserine-salicylate and pilocarpine, while those which, when given internally, cause the same state of the pupil are: opium or its derivatives, carbolic acid, creosote, pilocarpine, muscarine, and alcohol in lethal doses. Dilatation is produced locally by cocain, homatropin, atropin, euphthalmin, hyoscyamin; and, when given internally by such drugs as aconite, chloral, cocain, conium, digitalis, ergot, amyl nitrite, atropin, scopalamin and quinin. In considering any pupillary phenomena it needless to add we must always rule out any drug action either locally or internally.

In violent emotions, such as anger, the pupils are usually somewhat dilated due to stimulation of the sympathetics. In sleep they are contracted, while in coma and death they are dilated.

Local conditions of the eye, such as foreign bodies on the cornea and inflammatory states of anterior segment of the eyeball, cause contraction in varying degrees. Glaucoma, optic atrophy or total blindness from any cause which does not destroy the eyeball usually cause a dilatation.

It is, however, in diseases of the central nervous system that our pupillary findings may give us our best clues as to the process going on. Anisocoria, or unequal pupils, is a common finding in a great many cerebrospinal diseases, although a great many observers have reported it in a certain percentage of apparently healthy people. It is the author's rule where he finds slight inequalities existing but where the response to light both direct and consensual, and the response to accommodation are normal to attach no especial significance to the finding. If, however, there is inequality with partial or total loss of response to light, then he feels that the finding is significant and that an attempt should be made to determine its cause. Probably the greater majority of these cases occur in connection with some form of central nervous system lues.

A dilated and partially fixed pupil either alone or in conjunction with paralysis of some of the eye muscles is a very common finding in central nervous system lues, although it is not found in every case of such nature. But whether found alone or in connection with other paralyses, it is always the custom to advise the patients of its significance and of the course they should pursue to determine its cause.

The so-called Argyll Robertson or contracted pupils which do not react to light but react to accommodations are very characteristic of tabes. They sometimes make their appearance several years in advance of other symptoms but are more often manifest in the advanced, rather than the incipient stages. Different statistics vary, but the average is about 75 per cent. of all cases of tabes who show Argyll Robertson pupils. From 27 to 60 per cent. of all cases show an inequality of the pupils according to these same figures. While the majority of cases of tabes falls within the above class, there are some cases which have normal or even

dilated pupils. The latter is more apt to be so if there is an optic atrophy along with the tabes.

In paresis the appearance and action of the pupils is one of the earliest characteristic signs. Dercum, in speaking on this subject says: "One of the earliest phenomena observed in paresis is an inequality of the pupils." He further states that in the early stages a difference in the promptness of response to light between the right and left pupil is the rule. Likewise an impairment of the light reaction may be the first symptoms of a pupillary disorder in paresis. Inequality of the pupils has been observed in as low as 27 per cent. and in as high as 100 per cent. of paretic cases, according to different men. This wide variation is probably due to difference in interpretation of findings and also to closeness of observation. However, inequality and deformity of the pupils are almost universally mentioned as one of the earliest signs of this disease.

While in paresis the response to convergence and accommodation may be retained for a considerable period after the response to light is lost, being in this respect similar to tabes, yet in a great many cases of paresis this response of pupil to convergence and accommodation is also lost; especially is this so in the later stages of the disease. In this respect they differ from tabes, where the response to accommodation is nearly always retained. Also in tabes both pupils are more apt to be contracted, while in paresis only one or possibly neither is contracted.

In brain tumor there are no absolutely characteristic pupillary findings. If the tumor is above the tentorium or located in frontal areas there is apt to be no pupillary change at all. If located below the tentorium and particularly above the base, the pupil on the side of the lesion is very apt to be dilated and fixed, due to paralysis of the pupillary fibers of the oculomotor nerve from increased intracranial pressure. Here, however, the pupillary changes can only

be interpreted in the light of other findings. In severe head injuries with intracranial hemorrhage the pupillary changes are sometimes very striking and very significant. Holman and Scott of Cleveland recently reported a series of six cases of severe skull injuries with intracranial hemorrhages, in all of which the pupil on the same side as the lesion at some time or other became dilated and fixed. While in several of their cases this was of a transitory nature, yet their conclusion from a study of these six cases was that a unilateral dilatation and fixation of the pupil were a valuable aid in determining the location of intracranial hemorrhage following head injuries.

Pupillary changes are also present in connection with various general diseases. Following diphtheria, especially when antitoxin is not given, it is not at all uncommon to see the pupils dilated and slightly impaired in their response to light. Partial or complete loss of accommodation is usually associated with this dilatation. In tuberculosis of the lung, especially if of the apex, a dilatation and partial fixation of the pupil on the same side as the lesion is sometimes found. Here the dilatation and partial fixation is probably due to pressure of the enlarged bronchial glands on the sympathetics, with their constant stimulation and action on the pupil, which causes it to dilate.

With aortic disease we will sometimes get a dilated and partially fixed pupil, usually the left. By some men this is thought to be due to stimulation of the sympathetics by enlarged lymph glands, while by others it is thought that the aortitis and dilated pupils were both symptoms of the one disease, syphilis.

While there are no pathological pupillary changes which are absolutely pathognomonic of any one disease, yet there are certain changes which should at least be highly suggestive to us. Especially is this so with the unilaterally dilated and partially or absolutely fixed pupil which should always bring to our mind cerebral

disease, usually in some form of central nervous system lues or some of the conditions of the general system which have just been mentioned. In all cases, however, we should interpret pupillary changes only in the light of other physical findings.

[This is a very instructive article and will be appreciated by all who read it. With regard to the Argyll Robertson pupil, the author has rightly pointed out that this is usually a contracted pupil. It calls to mind a recent case in which the medical examiner of a life insurance company refused to accept a man for insurance on the ground that he had Argyll Robertson pupils. Careful examination showed that he had unusually dilated pupils which were extremely sluggish to light reaction, but they did react very slightly to strong light stimulation, showing conclusively that it was not an Argyll Robertson pupil. The insurance company accepted the man on this finding.—Ed.]

Atropin and Epinephrin in Iridocyclitis. None of the standard textbooks on ophthalmology mention the use of subconjunctival injections of epinephrin or atropin in iridocyclitis. It has been supposed that subconjunctival injections are contraindicated in all acute inflammatory processes of the iris and ciliary body. The encouraging reports of the use of subconjunctival injections of epinephrin in increased intraocular tension suggested to F. H. Rodin[1] its use in combination with atropin in iridocyclitis. This observer reports nineteen cases treated in this way in which instillations of atropin did not bring about the maximum dilatation of the pupils.

Acute iridocyclitis is an emergency, in the sense, that it calls for immediate treatment. No case of iridocyclitis may be considered under control unless all synechiae are broken down and the pupil is dilated, the greater the possibilities of sequelae, which are: posterier synechiae, pupillary membrane, exudate be-

(1) Am. J. Ophth., January, 1926.

tween the iris and the lens, atrophy of the iris, exudate in the vitreous, changes in the cornea, and opacity of the lens. Further, recurrences are more frequent when the synechiae are left behind. With the dilatation of the pupil the hyperemia of the iris is lessened the inflamed organ is put at rest, the photophobia passes off, vision improves, there is a gradual diminution in the severity of the eye pain, and the patient's condition begins to improve. Once the pupil is under control and with the application of such systemic treatment as may be called for, one may look forward to cure of the iridocyclitis.

The "sheet-anchor" of the treatment is atropin. However, there are cases where the usual method of instilling atropin fails to break the adhesions which have already formed. Ten cases of acute iridocyclitis, which are reported, were of the latter type, in which the repeated use of atropin failed to dilate the pupil to its maximum and where a subconjunctival injection of atropin and epinephrin brought about the desired effect.

Taking the cases as a whole, it appears that it is not so much the large dose of the atropin used as the added epinephrin which brought about the desired dilatations.

The routine method at the Stanford University eye clinic is as follows: If a case is diagnosed as acute iridocyclitis, instillation of atropin 4 per cent. is instituted at once. This is repeated every half an hour. If within two hours after the first installation, a good dilatation is not obtained, a subconjunctival injection of atropin and epinephrin is given. Hot applications are applied to the eye for half an hour. If good dilatation is obtained after the injection, the patient is sent home, otherwise he is admitted to the hospital for further treatment. The patient reports daily to the eye clinic and in the meantime a search for the etiology of the iridocyclitis is made. When the cause is found the

necessary systemic treatment is instituted in addition to the local treatment.

If the patient is over forty-five, or there is a slight increase in the intraocular tension, homatropin, 1 per cent. is used and the effect of the drug on the tension is observed. If there is no increase in the tension, atropin 1 per cent. is used. This is followed by atropin 4 per cent. if the tension is still unaffected. If there is a marked increase in the tension a subconjunctival injection of 6 minims of epinephrin is used and when the tension is reduced, instillations of atropin are instituted and followed by subconjunctival injections, if necessary.

In cases of increased intra-ocular tension which cannot be lowered by an injection of epinephrin, and in which the use of atropin has the tendency to increase the tension, we are, as Elliot states, "between Scylla and Charybdis." Such cases are studied individually and the treatment instituted is that which will give hope of best results.

If one has definite evidence that glaucoma is due to iridocyclitis, the logical treatment appears to be atropin, to be followed, as Elliot suggests: "By surgical means without any delay, if the exhibition of this drug should result in an increase, instead of in a decrease of the acuteness of the symptoms present." This is a further reason why an early dilatation of the pupil should be aimed at in all cases of iridocyclitis and so prevent the sequelae which leads to the increase of the intra-ocular tension.

As the increase in the tension is due to the iridocyclitis, the prompt treatment of the latter takes care of the tension. There is enough clinical evidence already reported by many ophthalmologists to show that subconjunctival injections of epinephrin will reduce increased intra-ocular tension in many cases. The injections of the combined drug can safely be used in

all cases of acute iridocyclitis failing to dilate under atropin alone.

Prompt alleviation of all symptoms was noticed after the injections. Since the use of the combined injections in cases in which instillations of atropin failed to dilate the pupil, there have been no posterior synechiae as sequelae to a case of acute iridocyclitis in this clinic.

Any conception of the modus operandi of the combined drugs must include the following well known facts pertaining to the pharmacologic action of the drugs, namely, that atropin paralyzes the oculomotor nerve fibers in the sphincter of the iris and in the ciliary muscle; that epinephrin stimulates the sympathetic endings of the iris and blood vessels, and that cocain acts as a local anesthetic and also stimulates the sympathetic. Whatever the ultimate explanation may be, the fact remains that in the cases here reported, in which instillations of atropin failed to dilate the pupil to the maximum, the combined injection of atropin and epinephrin brought about the desired result.

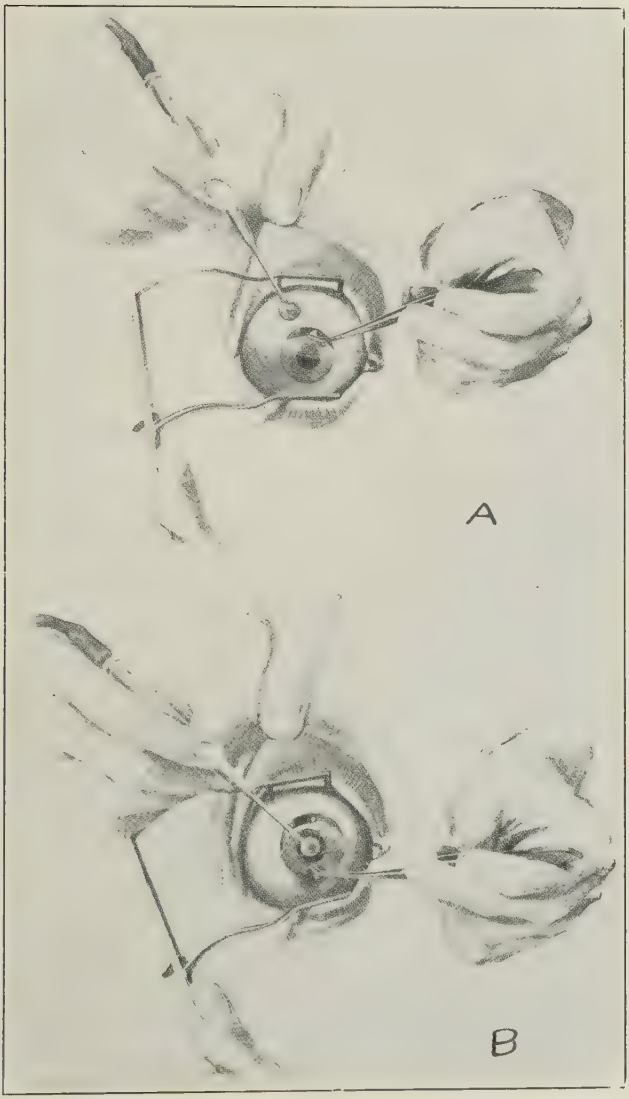
The combined injection appears to have little or no effect in old adhesions. In three cases there was no effect in one and a slight separation in the other two.

A subconjunctival injection of atropin and epinephrin should be used where instillations of atropin or the use of crystals of atropin fail to dilate the pupil. This should be repeated if necessary.

Age is not a contraindication to the injection.

Where for any cause a rapid or instantaneous dilatation of the pupil is called for, a subconjunctival injection of 2 minims of atropin, 2 per cent., and 3 minims of epinephrin, 1:1000, is indicated.

Further clinical observations of the use of the combined injection are desirable in order to arrive at a decision as to its final usefulness in breaking down old adhesions, the safest and the most effective dose of the two drugs, and the mechanism of action of the two drugs.



A.—Conjunctival flap grasped with pressure forceps in the left hand, while the canula is being introduced with the right hand.

B.—Pressing on the limbus with the ball of the forceps, as the cataract is being extracted. (From A. S. and L. D. Green's article on "The Intracapsular Expression Extraction of Cataract.")—Wolfe, page 119.

Intracapsular Extraction of Cataract by the Barraquer Method. Ophthalmic surgeons are divided into two schools regarding the operation for senile cataract; those who do a capsulotomy before they remove the lens, and those who endeavor to remove the lens in its capsule intact. The first group admit that the delivery of the cataractous lens in its capsule is the ideal method, but contend that the operations so far advanced have possible complications that render it undesirable.

Those surgeons who advocate the intracapsular method are divided into two groups; *i. e.*, those who deliver the lens by expression, and those who endeavor to extract, or lift it out.

The intracapsular operation by expression has been popularized by Col. Henry Smith of India, and is known as the Smith Indian operation. It largely differs from the old operation in that no capsulotomy is performed.

In spite of the excellent results obtained by men like Fisher performing the Smith Indian operation the majority of conservative American surgeons feel that the operation subjects the eye to unnecessary risks. Their chief point of criticism is that the large amount of pressure required to rupture the zonule and express the lens may at the same time rupture the hyaloid membrane, with subsequent disorganization, or loss of vitreous.

The advantages of all of the intracapsular methods (removal of the lens in its capsule intact) over the old capsulotomy method are that no subsequent "needlings" are necessary, and the stage of convalescence and disability is greatly shortened. Its advocates feel that even though small amounts of vitreous are occasionally lost, still this is not the bugaboo that it has

been held up to be and, while undesirable, does not offset the many advantages of the intracapsular methods.

The surgical procedure known as needling subsequent to the old method of cataract operation may not be of such great consequence to the surgeon, but to the patient it means much.

It usually takes a month or so after the cataract extraction for the inflammation and reaction to subside so that the first needling can be performed. Following this procedure a few more week must elapse, and intensive treatment must be used to cause the remnants of capsule and lens to absorb and shrink.

Not infrequently following this first needling the surgeon is disappointed in finding the opening in the capsule is small or irregular, or else it is not placed so it gives good central vision and a second, or even third, needling is necessary, or advisable.

The patient cannot be given his glasses until most of the inflammation and reaction following these needlings has subsided, which means that they have no useful vision for weeks, or months, after the cataract extraction.

The surgeon is required to do much explaining to convince the patient that these procedures and delays were necessary and unavoidable. All of these objections are obviated and rendered unnecessary by intracapsular extraction.

Ignacio Barraquer, of Barcelona, Spain, has evolved a method of intracapsular extraction that has all the advantages of the other methods, Smith Indian, Knapp, and so forth, without their disadvantages. He has elaborated the vacuum method first suggested by Hulen. This method is known as phaco-eresis. According to Lloyd Mills, it was first suggested to Barraquer when, after watching a leech at work on the temple of a patient, he conceived the idea of inducing a leech to attach itself to a lens in the hope that the lens might be

extracted intact by merely pulling the leech out. Such an extraction was successfully done on a first and only patient, and from this crude procedure sprang Barraquer's phaco-eresis.

He devised an electric motor driven apparatus that produces both vacuum and vibration, and a tip or cannula made of platinum. The cup tip of the cannula is attached to the lens by vacuum, and the lens lifted out. A valve in the side of the cannula, operated by the thumb, controls the vacuum. This is, therefore, an intracapsular method by extraction.

He first presented his method and apparatus in America at the International Congress of Ophthalmology, Washington, D. C., April 25, 1922. He operated on a considerable number of cases in some of our eastern cities, with excellent results. His method was received with much enthusiasm, especially by the advocates of the intracapsular method, although his apparatus was considered complicated and unwieldy for other operators than its inventor.

A. S. and L. D. Green have introduced alterations in the Barraquer apparatus that have done away with the most complicated features. They have added a foot-controlled suction valve and constructed a much more simple and rugged motor with an accurate pressure gauge. They have also improved the cannula, it being much lighter and can be held in the hand as delicately as a cataract knife. In their technic, they also apply pressure on the lower cornea with a special ball tipped forceps, making their technic a combined expression and extraction. This forceps does facilitate delivery in many cases. It is not always necessary, but by utilizing this forceps to raise the corneal flap its ball tip can be readily used if it is found advisable in difficult cases.

Otis Wolfe[2] believes that the Barraquer-Green

(2) J. Iowa M. Soc., November, 1925.

method should be attempted in every suitable case on account of its great advantages.

Even if the capsule should rupture, or tear, before the suspensory ligament is broken, we are just as far ahead as if we had set out to do the old operation and have the satisfaction of feeling that we have made an effort to give the patient something better. According to R. G. Viandi, also of Barcelona, Spain, the technic is applicable to Morgagnian cataract, also.

The Barraquer-Green method would seem to be especially well adapted to the incomplete cataract as the capsule is not friable. The method has not been advised where the cataract is complicated by glaucoma, diseases of the vitreous, the uveal tract, or in traumatic or juvenile cataract. It is also contraindicated in dislocated lenses and cases with posterior synechia. The patient with a prominent, or bulging eye is least adapted to the technic on account of the difficulty of controlling the lids. The lids and the brow can exert great pressure on the eyeball of such a patient, and the increased intra-ocular tension might cause expulsion of vitreous.

Phaco-eresis, or vacuum extraction of the lens, as performed by Barraquer and Green, is an operation of exacting technic personified. The end, however, justifies the means. It fills the long felt want of the conservative but capable ophthalmic surgeon who desires the best for his patient. Highly trained assistance is absolutely necessary. The assistant controls the lids by means of Fisher lid hooks and directs the nurse assistants when the surgeon's thoughts are occupied.

Method of Procedure.—The case is carefully studied and the patient's elimination raised as high as possible beforehand. White's ointment is instilled the night before both of the operative procedures. A medium sized iridectomy through a keratome incision is then performed, the pupil being fully dilated by atropin. Preliminary iridectomy is always conducive to good

results in any kind of cataract work, but more especially so with the Barraquer-Green method. There is no blood in the anterior chamber to hinder the operator's view when placing the suction tip and noting its action and lift. It also greatly lessens the chance of infection. The patient also becomes accustomed to manipulations of the instruments in the orbital cavity and learns to cooperate with the surgeon, especially in regard to movement of the eyeball and how to close the eye gently without squeezing.

After the iridectomy has been performed, sufficient time is allowed to elapse for inflammation to subside, usually about ten days to two weeks. The Barraquer-Green operation is then performed after the apparatus has been carefully checked.

It is necessary to make a full one-half section of the cornea, and best to terminate the incision with a conjunctival flap. A suture of Kalt silk is placed through and through with a large loop which is laid to one side out of the operator's way. The corneal section is then raised with the Green forceps in left hand and the cannula tip is then placed in apposition to the lens, being careful to place it evenly. (Plate XIII.)

While the healed edges of the iris are not easily picked up by the suction tip, care must be exercised to see that they are free. The fact that the iridectomy has been done previously is of the greatest aid to the operator in placing the cannula tip evenly and lightly on the cataract, as there is no blood in the anterior chamber to obstruct vision.

The vacuum is then applied by the foot switch, with the associate watching the gage and informing the operator when sufficient vacuum has been created. The cannula is then rocked back and forth a few times to rupture the suspensory ligament. This rocking also does away with the temporary vacuum produced behind the lens which would tend to lift the vitreous body as well. This point is very essential. The lens is

then lifted and delivered, the upper border first. If the lens does not deliver readily, the ball tip of the Green forceps is shifted to the globe, just below the limbus, and light counter pressure is made with it at the same time the lift is made on the lens with the cannula. The operation then becomes a combined extraction and expression.

At this point it is highly important that the assistant have full and absolute control of the lids and the patient be especially cautioned not to squeeze. Very little or no toilet is necessary, except smoothing out the conjunctival flap, if it should be turned under, and quickly tying the Kalt suture. Eserine and White's ointment is instilled and the eye bandaged.

Unless there are some symptoms or complications, both eyes are bandaged for two days and left undisturbed. On the second day, the operated eye is inspected and treated with White's ointment. The unoperated eye is left uncovered after the third day.

Ordinarily patients have been kept quiet in bed for one week.

At the end of one week, the operated eye can be left uncovered part of the time. At this time one will note that there is much less reaction than with the ordinary capsulotomy method. This is due to the avoidance of manipulations and pressing, usually necessary to expel lens and capsule remnants by the old method; and secondly, there is no irritating lens substance remaining to produce inflammation or exudate, or to set up an iridocyclitis, or subsequent retinitis and later affect the vision. There is no secondary cataract or capsule remaining to deal with. The pupil and anterior chamber are clear and practically no ciliary injection, or conjunctivitis, remains. The patient is delighted to have his vision when the dressings are removed.

In selected cases the Barraquer-Green operation is ideal. It is particularly adapted to uncomplicated cases of mature senile cataract. It must be emphasized

however, that it is not an easier method for the surgeon, but one that requires greater dexterity and more exacting technic than the old capsulotomy method.

Preliminary iridectomy should be considered an important and necessary step in the procedure.

When a perfect delivery is accomplished by this method, it is a source of great satisfaction to both the surgeon and the patient.

The surgeon has the feeling of having accomplished the ultimate in cataract surgery.

Intracapsular Extraction of Immature Cataract. The method of operation for immature cataract, when intracapsular extraction seems advisable, is described by C. H. Bagley,[3] resident ophthalmologist of the recently established Wilmer Clinic of Johns Hopkins Hospital.

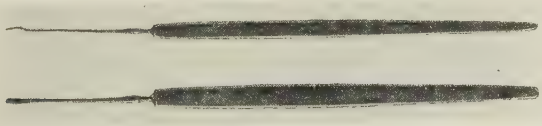


Fig. 16.—Small instrument with which surgeon massages anterior capsule of lens to hasten maturity.

In these cases, a preliminary iridectomy is performed with massage of the anterior capsule of the lens, followed by an extraction three weeks later.

The preliminary treatment is described in detail.

After the speculum has been inserted, the eye is grasped with fixation forceps below the cornea, and the keratome is inserted at the limbus in the midline above. The knife is passed well across the anterior chamber making a wide incision. As it is withdrawn, the iris usually follows it with the escape of aqueous. The prolapsed iris is withdrawn through the wound and excised in the usual manner. The surgeon inserts a small instrument (Fig. 16) with which he massages the anterior capsule of the lens to hasten its maturity. The

(3) Surg. Gynec. Obst., May, 1926.

pillars of the coloboma are replaced and the speculum removed. The eye is dressed by putting a small amount of 1 per cent. atropia salve into the conjunctival sac toward the outer canthus, and by completely filling the remaining portion of the sac with 1:10,000 bichlorid salve. Both eyes are bandaged and Ring's ocular mask applied. A stretcher is brought into the operating room; and after the table has been adjusted to the same height as the stretcher, the patient is transferred by four assistants, one at the head, one at the foot, and one at either side of the canvas band passing beneath the patient's back. This transfer to the stretcher is made without the slightest bit of effort on the part of the patient.

The postoperative orders are:

1. The patient is to remain flat on his back in bed for 5 hours.
2. The diet for 24 hours is to be liquid.
3. Bowels are to be moved 48 hours after operation.
4. All brilliant daylight is excluded; the room to be illuminated by a specially constructed floor lamp placed beneath the bed.
5. The patient is to have 20 grains of sodium bromid if discomfort should arise.
6. The house surgeon is to be called if the patient should have any discomfort.

On the day following the operation, the surgeon removes the bandage, taking every precaution not to hurt the patient, lest the patient should squeeze the eyelids together and injure the eye. For this reason the silk adhesive which holds the eye bandage in place is soaked off and *never pulled*. The eyelid is carefully opened by the surgeon and his assistant, who instruct the patient not to make any voluntary movements whatever. The cornea is examined with candle light only. A 10 per cent. solution of argyrol is instilled into the lower conjunctival sac and allowed to remain there

two minutes, after which the eye is irrigated with boric solution. The lower culdesac is then filled with atropia and bichlorid salve, the skin around the eye gently wiped with boric acid solution, and an eye pad and bandage applied to the eye operated upon, leaving the good eye free. This dressing is continued until the seventh day after the operation. On the eighth or ninth day, the patient is discharged from the hospital with the following instructions:

1. Three times a day, one or two drops of boric acid solution should be instilled into the eye that has been operated upon.

2. Atropia is to be used only in case of irritation.

3. Be very careful about exposing the eye operated upon to bright light or wind. The other eye should be used only for the most necessary things.

4. Three weeks after the preliminary iridectomy, the patient can return to the hospital for removal of the cataract.

5. In case the eye should give any trouble, immediately consult an oculist or take the first train for the Institute.

When the patient returns to the hospital. an interval history is taken in which everything of importance is noted. Conjunctival scrapings and cultures are taken, urinalysis and blood count are made, and the patient is prepared for operation on the following day in the same manner as for preliminary iridectomy; but in addition, the pupil is dilated by atropin.

The Danger of Infection Following Operations When the Eyeball Is Opened. The danger of infection in cataract operations is ever present until the healing process is complete. All investigators have agreed that postoperative infection in modern eye surgery, with rare exceptions, has its origin in the conjunctival sac; since we cannot sterilize the culdesac, then we must do the next best thing.

George Huston Bell,[4] who has had an experience of over twenty years in cataract work, and who reports the results of fifteen hundred operations, believes that postoperative infection in eye surgery is a preventable disease if the method advocated by him is carefully followed. As a first step, he says the focal infections, such as oral sepsis, diseased tonsils, and toxemias of the intestinal tract, must be removed. It is just as necessary for the ophthalmic surgeon to "get his house in order" before subjecting his patient to a major operation upon the eye, as it is for the general surgeon to clean house. Every patient, whether clinical or private, must stand the acid test for the "three T's"—teeth, tonsils and toxemia—before we even consider the operation.

All of this work on focal infections must be done from two to three months before the patient is admitted to the hospital. We lay great stress on this work, as we must study the general condition of patients more than we have done in the past. A Wassermann test is made in zonular and complicated cataracts, also in all senile and juvenile cataracts. The urine is examined several times previous to the operation, and the height of blood pressure must be known.

Twenty-four hours before the operation a dose of castor-oil is given, as nothing sweeps and cleans the intestinal tract like castor-oil. It has been the standby of physicians since time immemorial.

One hour before the operation a smear of the conjunctival sac is taken, after which two drops of a 1 per cent. solution of silver nitrate are instilled into each eye. The silver produces an irritation, but not an inflammation, so that when the patient comes to the operating table the eyes look red and inflamed, with a certain amount of mucus at the inner corners. The brow, the eyelids, and adjacent skin are washed thoroughly with castile soap and water, and the eyes are then washed out with a normal salt solution as a means of freeing the

(4) M. J. & Record, May 19, 1926.

operating field of mucus, dust, and the like. While the eye is undergoing cocainization it is bathed continually in a 25 per cent. solution of fresh argyrol. In other words, every time a drop of cocain solution is used in the eye, a drop of 25 per cent. solution of argyrol is instilled. The slogan is "drop for drop."

Duane, in speaking of his method, calls it "artificial preoperative leukocytosis" and he further adds: "The good results obtained by this practice in eye operations seem well substantiated by statistics and the translator believes that it is based on sound theory."

Silver nitrate and argyrol furnish a marked degree of stimulation to the conjunctiva and in that way leukocytosis is produced. They promote phagocytosis and the formation of antibodies, and in this way put the tissues into a stronger state of defense against the invasion of micro-organisms. Even were an inflammation produced by the silver and argyrol, it would only diminish the probability of infection, not increase it. because the leukocytes and their leucins are valuable aids in combating bacteria. And what makes the phagocytes so active? It is the preoperative removal of foci of infection—going after the "three T's."

Delirium Following Cataract Operations. Disturbances of the mind following surgical operations have been recognized since the sixteenth century when Pare reported certain mental symptoms which occurred in patients after these procedures.

From an exhaustive study of the literature on this subject, F. C. Thomas[5] states that mental disturbances follow cataract extraction in from 2.5 per cent. to 3 per cent. of cases.

Also that they do not occur after cataract operations any more frequently than they do after other surgical procedures. The percentage of frequency in the two sexes is probably very nearly the same. The duration varies widely but commonly from three to five days.

(5) Kentucky M. J., March, 1926.

These psychoses begin most frequently from the second to the fourth day after operation. There have been many theories advanced as to their cause. The argument that old age is the most important factor, because most of these patients are from 69 to 72 years of age does not seem to hold good, since the average age of all patients operated upon for cataract will be found to be between 69 and 72; a further argument against it is the fact that one half of Kelley's cases were in patients below forty-five. The theory of predisposition to mental imbalance advocated by Lopez, Schmidt-Rimpler, the Congress of Alienists and others, seems rather probable in some cases, although such tendencies can be demonstrated only very rarely. Posey says that two of Lopez' cases were probably quite insane before operation and should not have been reported as cases of postoperative psychoses. Martin could satisfy himself of a state mental weakness in but two cases in the literature, and Posey could find only two with any taint of the sort in his series. The bandage theory must be discredited as being of prime importance. Eleven of Kipp's twelve patients developed their psychoses with no bandage on the eyes, and Gorecki and Calderon reported cases occurring in patients without bandages. Kelley, Werth, Balldy, and Urbach have reported case after case following general surgical operations where, of course, the patients were not even placed in a dark room. Posey could find no case among his 24 where the patient was benefited in the least by their removal. There have been cases reported by Valude, Hirschberg, Borelli, Swanzy, and Pfingst, in which removal of the bandage has been followed by recovery from the delirium, but this must be considered a coincidence, at least in most cases. If darkness were the prime factor, we should expect to find psychoses much more common among the blind than is actually the case Atropin cannot be considered a cause, for in over half of the cases in the literature it was not used.

Anesthetics, local and general, as causative factors, cannot be considered seriously, as these disturbances occur in patients where no anesthetic is employed. Kelley reported one case occurring a few hours after a cystoscopic examination, where no anesthetic was necessary.

Autointoxication, from retention of urea and other products of nitrogen metabolism, must not be regarded too lightly as a cause. It seems probable that it plays more of a part than is generally thought, and will be shown to play an even greater part when renal function tests are made routinely before operation and chemical examination of the blood is made on all patients as soon as they show the slightest sign of mental unrest.

Undoubtedly, a large number of these cases of delirium occur in patients who are very nervous and apprehensive about the operation, and in those who do not accommodate themselves well to strange environment and strange routine. Parinaud was the first to advocate the theory of nervousness, and Posey is heartily in accord with it. The patient may be outwardly calm and collected, but in reality he is suppressing a great excitement. He is afraid of the operation itself, and afraid of the outcome of it. The thought that he may see again after weeks, months, or years, of partial or total blindness, must cause a great turmoil within him which requires no end of self-control to suppress. He is staking the future happiness of his life on the results of the moment, and during the operation is under severe tension, in order that he may do everything just as he is told to, so as not to mar in any degree his chances for a perfect result. The sudden realization that it is all over and that all he has to do is to be quiet and await results must cause a profound reaction, and play a large part in the development of the derangement. Then add to this the fact that he is in a totally strange place, away from the

thousand and one things commonly known as "familiar surroundings," and it is no wonder there is an occasional break. Everyone knows that there are many people who do not bear well any change in their surroundings and their routine even when well. It is not surprising that this group should show mental disturbances when an all-important operation is added to their list of worries. Kipp sent all his patients home that could be moved as soon as the delirium developed, and in every case this procedure was followed by immediate recovery. He believes the majority are cases of nostalgia ending in delirium, melancholy, and the like. Bruns quite naturally is very strongly of the opinion that change of environment is the determining factor, since in a series of 232 cataract extractions in which the patients were allowed to leave the table and proceed immediately to their homes, returning daily for dressings, he has observed not a single case of mental disturbance of any kind. It seems probable, then, that no one factor can be considered the cause of all postoperative deliriums, but rather that some of the latter are undoubtedly caused by a predisposition to mental aberration; some follow states of autointoxication from retention of products of nitrogen metabolism; and the largest number occur in patients who are apathetic before the operation and whose reaction following it —coupled with their natural inability to accommodate themselves to strange surroundings—proves too much for them, and their mental grip is temporarily lost.

Much may be done toward prevention of these psychoses if due care is exercised. The history of the patient should be gone into thoroughly and painstakingly. Any previous tendencies toward delirium or other forms of mental disturbance should be noted, and it is generally agreed that if the patient has been subject to psychosis in the past he is very likely to develop another after almost any kind of operation. Complete urinary examination before operation should

be done routinely. Inquiry should also be directed toward mental attitude of the patient as to the operation. Is he sure it will be a failure and that he will never see any better than he sees now? Is he convinced he is going to die? Where such feelings are found to be present and the time of the operation is optional, it should be postponed until such time as a change can be wrought in his general attitude. It should be impressed upon him that the operation is a simple matter, all in the day's routine, and the family should, of course, be apprised of the danger attendant upon such a procedure, that there is chance for failure, but when possible no element of doubt should be allowed to enter the patient's mind. The more air of mystery there is about the operation, the more serious the patient is made to feel that it is, the more pomp and hushed silence there is about the operating room, the more apt is the patient to react badly afterward. After the operation one should be on the lookout for the first appearance of symptoms. The patient should be gotten out of bed as soon as possible and allowed to sit in a chair. Fisher recommends that a member of the patient's family should remain with him all the time whenever it can be done, as he regards that as the best preventive of homesickness and restlessness that can be employed. When this is not feasible, a competent, tactful nurse in constant attendance is most important. Bruns recommends sending all patients home immediately after the operation. Most authors advocate immediate removal of the bandage from the unoperated eye as an aid to recovery after onset of restlessness. At the first sign of undue excitement, hypnotics, such as the bromids, chloral, trional and the like should be administered, and the patient reassured as far as possible. His small whims should be satisfied when harmless to himself, and the general atmosphere of the room made as homelike as possible. Greenwood advocates the removal of cataracts in the home

whenever feasible, though it is doubtful if this would cause a cessation of cases of delirium, as Zantmayer cited two cases following operation in the home.

Once the delirium is well under way large doses of sedatives are indicated. The opiates are not very useful as they often make the condition worse. Scopolamin must be used in very obstinate cases but the variability of action of this drug renders it less valuable than some of the others. The best of the sedatives are the bromids and chloral. Posey used them with uniformly good results. Trional and veronal are useful in some cases, though sometimes they have the opposite effect. In one of the author's cases, veronal was the only thing that gave satisfactory results. When possible the patient should be sent home, as it is altogether probable that familiar surroundings will do more toward causing a speedy recovery than all other methods combined. Free purgation is important, the blood should be examined for nitrogen retention, and care taken that the urinary bladder is not allowed to become distended. The patient should be encouraged to eat full and nourishing meals, and plenty of water should be given him. A capable, tactful nurse or attendant who is physically able to restrain the patient and prevent him from harming himself, should be in constant attendance.

The prognosis as a rule is good, both as regards the vision and the ultimate recovery of mental balance.

The Lens-Antigen Treatment of Cataract with Consideration of Some Special Features. The use of protein therapy, particularly in diseases of the eye, is of comparatively recent date, and the exact way or method in which the various proteins—specific and otherwise—such as lens-antigen, tuberculin, diphtheria antitoxin, egg albumen, milk, peptones, and so forth, act when injected into the body organism, is not yet fully understood.

That they are very powerful remedies, however, and act in some mysterious manner to bring about, at times,

arrest or cure of diseases when other remedies have failed, must be admitted by all who have given the subject serious attention.

Besides giving a brief history of experiments with lens-antigen, its preparation, method of use, and the results obtained by its use, A. Edward Davis[6] describes some observations noting its effect on the whole body organism other than its specific action on the eyes.

His experience in the use of lens-antigen extends over a period of twenty-three years, having used it first on animals and for the last five years on the human being. In his first experiments (1902-03) the passive form of treatment was resorted to, that is, an animal was immunized against lens-antigen, then bled, and the serum from this blood was injected into other animals (guinea-pigs) suffering with cataract, in an endeavor to absorb the cataract.

These experiments were only partially successful. Later, Uhlenhulth's announcement that the crystalline lens was *organ* or *tissue* specific, a very fortunate discovery, allowed us to go to the lower animals, such as sheep and cows, to obtain the material in quantity for the manufacture of the remedy, lens-antigen, which antigen could be used in the treatment of cataracts in the human species.

At present the lens-antigen is given directly to the patient under treatment, that is, the active form of treatment is carried out. In other words, the patient is made to manufacture his own antibodies in combating the disease-cataract. And this method has proved much more effective than the passive form of treatment by means of serum injections.

The special features in the treatment of cataract by the use of lens-antigen, are:

1. *The Importance of Early Diagnosis and Treatment.*—Five years' experience in the use of lens-antigen in the treatment of cataract in the human

(6) Am. Med., June, 1926.

species has already demonstrated the value of early treatment in these cases, if the best results are to be obtained.

Up to the time of the present writing the author has completed the lens-antigen treatment in more than 250 cataractous eyes, and in 71 patients who had cataracts in each eye, the less advanced cataract was arrested and improved in 50.70 per cent. of the cases: the improvement in the two eyes was equal in 33.80 per cent. of the cases; and the more advanced cataract was improved in only 15.74 per cent. of the cases. In other words, the less advanced cataract (in the same individual) was more improved than the more advanced cataract in the ratio of more than 3 to 1. This ratio would be even more disproportionate were only the very early cases of cataract compared with the decidedly advanced cases. These figures, therefore, emphasize the necessity of early diagnosis and treatment. In fact, the earlier the diagnosis of cataract is made, and the quicker the treatment begun, the more favorable the prognosis. He would suggest, therefore, that all presbyopes, when they come for their first glasses, should have the pupils dilated and a careful examination made to determine if the patient has beginning cataract. If the patient has incipient cataracts, he *should be informed* of the fact (unless very feeble or nervous) and advised as to the necessity of early treatment in order to *preserve* the vision. It is not wisdom, nor indeed good policy, to let the patient drift along until the sight is almost lost, then tell the patient he has cataracts, and that it will be necessary to wait until vision is lost, or almost so, before anything can be done, when an operation is necessary. The hygenic care of the eyes, the careful correction of refractive errors, the local use of "drops" of one kind or another, general tonics, and so forth, all have their place in the treatment and retarding more or less the advance of cataract; yet that such measures alone are not suffi-

cient to check the progress of cataract is attested by the thousands of cases of cataract which progress to maturity with loss of vision. Such remedies have been used from time immemorial, but the terror of cataract with resultant blindness is still with us and will continue to be unless we use some specific remedy to check it.

That we have such a specific remedy in lens-antigen has been demonstrated by the cases reported by him, in which the cataracts were checked in 85 per cent. of the cases treated by this method. Such results with preservation of vision are worth working for. And even in the cases not arrested, the operation is made more safe than in the cases not treated, since the patient has been desensitized to lens-albumen, and any lens cortex that may be, and often is, left at the time of operation is not likely to cause severe inflammation as now not infrequently happens in untreated cases.

2. *Types of Cataract Most Suitable for the Lens-Antigen Treatment.*—There has been some dissension as to which type of cataract is most common. Hess claimed that the cortical (subcapsular with vacuole formation) was the most common form of cataract, and his observations are held by most ophthalmologists today. A notable exception to this belief is that of Vogt, who states that the nuclear type is the most frequent. The author's observation leads him to stand with Hess and his followers. Professor Vogt, by the use of the slit-lamp, with which the nucleus is so plainly seen and its discoloration noted in all persons as they grow older, has been led into error. Unless there is distinct cloudiness of the nucleus, which can be observed with a good ophthalmoscope or loop, with some failure of vision, which cannot be accounted for by other causes, diagnosis of nuclear cataract should not be made. As a matter of fact true nuclear cataract is relatively uncommon.

The slit-lamp is of the utmost advantage in study-

ing the retrogression or advancement of cataract, because the changes can be observed by its use. And since the observations are objective they are of more value than subjective statements of patients.

The lens-antigen is most effective in the ordinary senile subcapsular cataract, while it has little or no effect on the nuclear type. In zonular and congenital cataracts the lens-antigen is effective; but since such cataracts are readily absorbed by needling and without reactions, it has been used in but few such cases. Diabetic cataracts are favorably influenced by the lens-antigen treatment. Traumatic cataracts and membranous cataracts with inclusions of cortical matter are favorably influenced by lens-antigen treatment. In fact, in traumatic cataract the patient in a great measure furnishes the lens- antigen himself. In other words, it is an autolysis of the lens. Complicating and strictly capsular cataracts are not, as a rule, influenced by the treatment.

Heart disease, high blood-pressure, diabetes, are not contraindications to treatment, many such patients have been treated without ill effects. This does not mean that the treatment should not be given cautiously, as indeed it should be in every case, when using protein treatment of any kind. Age is not of significance, as the treatment has been used on children four year of age, and on adults up to ninety-two.

3. *Anaphylactic Shock.*—Anaphylactic shock has been of extremely rare occurrence and of light form since *subcutaneous* rather than the *intravenous* method of injections of lens-antigen has been resorted to. In fact, shock of a serious nature should never occur if the *intracutaneous* sensitization test is first given and the reactions following the therapeutic injections carefully noted during the course of treatment. When the reaction to the sensitization test is very marked, as noted by the swelling and redness at the site of the injection, the therapeutic injections should be given with

special care, and gradually increased in amount as the treatment progresses, carefully noting any symptoms of reaction in the patient.

Symptoms.—(1) One of the very first symptoms indicating that the patient is reaching his *toleration limit* of the antigen is a feeling of *uneasiness* and *restlessness.* The patient is sure that something is wrong, but cannot explain it. (2) There is often a *dull headache* or fullness in the head, and at times, *dizziness.* (3) A feeling of *weariness* and of being *extremely tired* is characteristic. (4) Where the dose has been carried too far, there may be extreme pain in the back or in the legs, with nausea and at times a chill. (5) Difficulty in respiration may develop. (6) Fall of blood-pressure and fall of temperature may occur.

Pfeiffer asserts that by the fall of temperature alone delicate anaphylactic reactions may be determined when all other symptoms are lacking.

Treatment.—For mild anaphylactic reactions a reduction in size of the dose should of course be made. In case of decided shock, that is when pain, dizziness, nausea and chilliness supervene, the patient should be made to lie down, warmly covered, and five to ten drops of adrenaline chlorid given hypodermatically. A small dose of aromatic spirits of ammonia is often sufficient to restore the patient.

So far in the author's experience no serious results have followed from anaphylactic shock. Where the patient is particularly sensitive to the lens-protein the temperature should be taken daily, to observe if there is any fall, by which symptom alone, as above noted, Pfeiffer claims to discover any tendency to anaphylactic reactions in animals.

4. *The Great Advantage of Keeping Useful Vision.*—One great advantage in the lens-antigen treatment of cataract is that in 85 per cent. to 90 per cent. of the cases, if the treatment is begun very early, useful vision is maintained by the patient. By operative treatment

we must wait for the patient to become blind or almost so before the eye is in the best condition for the operation, and even then the percentage of restoration of useful vision is no greater than that obtained by lens-antigen treatment, and the patient, in the meantime, has lost anywhere from several months to one or two years from his occupation, or has only been partially able to perform his or her work. In the prevention method hope and confidence are aroused. In waiting for blindness, or almost blindness, that is ripening of cataract to supervene before anything can be done, the patient often becomes highly nervous and the health more or less impaired from lack of exercise. Another point in favor of the nonoperative treatment of cataract is that even in those cases where the cataract is not arrested, and must be operated upon, the operation is made much safer through the patient's having become immunized against any reaction from lens-cortex that may be left in the eye at the time of the operation.

5. *No Loss of Accommodation and no Heavy Glasses.*—If the patient is not operated upon, he maintains his normal accommodation, a factor of great advantage to him, for he can adjust his eyes to various distances; but if operated upon, his vision is adjusted correctly but to two positions, distance and near, while in all intermediate positions objects are more or less blurred. A second point of advantage in favor of the nonoperative treatment of cataract is that the patient is not compelled to wear very heavy glasses, as is usually the case after operation. Women patients, especially, object to the very heavy glasses necessary after cataract extraction.

6. *General Tonic Effect of Lens-Antigen.*—Besides the specific local action on the cataract itself, a most notable and almost constant result of this treatment has been the general tonic effect on the patient. In the first few patients treated, the remedy seemed to have a depressing action, but in most of the later patients

the general tonic effect, manifested by increased appetite, gain in weight, cheerfulness, and a happier outlook on life, has been most noticeable. The patients often remark that they feel fine, eat better, sleep better, and feel like doing something. This condition obtains especially when the remedy has been carried up just short of the "toleration point." If, however, the remedy is increased too rapidly or given in too large doses, it may depress the patient; consequently, we should keep within, or just below, the point of toleration. This general toning up of the patient probably accounts, in a measure, for the arrest of the cataract, by increasing the general nutrition through more active metabolism.

7. *Results Obtained.*—It is now five years since Davis began the use of lens-antigen in the treatment of cataract in man and he has used it in more than 250 cataracts, and the results obtained are most satisfactory. Including all types of cataracts, the ordinary senile subcapsular, nuclear, black, zonular, congenital, complicating, and so forth, the cases arrested amounted to between 85 per cent. and 90 per cent., the cases improved to over 50 per cent.; and were only incipient cases of non-complicated subcapsular cataract considered, both the percentage of arrest and improvement would be somewhat higher than his first reports, where all types of cataract, many in their later stages of development, were treated.

8. *Conclusion.*—In view of these results, obtained by himself and others who have used the lens-antigen treatment for the prevention of cataract, it is advised that all patients, when examined the first time for glasses to correct presbyopia, should have the pupils dilated and a close examination made for any sign of beginning cataract. If opacities are found, treatment should be begun at once, though the vision be normal. The thing to do is to keep the vision normal, and it can be done in at least 85 per cent. of the cases if treatment

is begun at an early stage of the disease. The ophthalmologist who does not give his patient the advantage of this preventive treatment does not do full justice to his patient. This is truly the day of preventive medicine and we ophthalmologists should strive to prevent disease as is now being done by physicians and specialists in other branches of medicine.

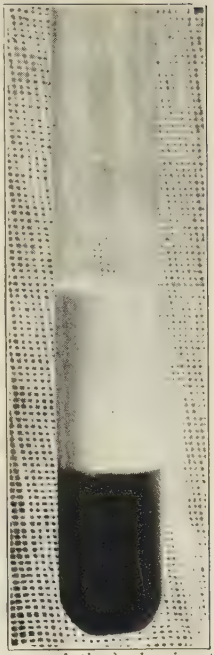
Method of Use.—1. Preparation of the patient: First, the patient's vision should be tested without glasses, then with his refraction corrected, and both recorded; second, the pupils should then be dilated with homatropine and a diagram of the lens opacities made, stating at the same time if the cataract is the ordinary subcapsular, nuclear, or zonular type, and so forth. Afterward, a drop of eserin should be instilled into the eyes to contract the pupils and avoid the danger of inciting glaucoma.

2. A sensitization test to the reaction of the lens-protein (in this case the lens-antigen) should be given. This consists in injecting four or five drops of the lens-antigen intracutaneously into the forearm of the patient, under antiseptic precautions, that is, the spot at the site of the injection should first be cleaned with alcohol and after the injection again wiped with alcohol. An ordinary sterile hypodermic syringe, preferably glass, which has been boiled, may be used for the test. Hypersensitiveness to the lens-protein is manifested by redness and a slight swelling at the site of the injection in two to twenty hours. If the reaction is very marked, the following therapeutic injections of the lens-antigen should be given cautiously and in small doses, until the patient becomes desensitized, when the usual doses can be given with safety.

3. The following day, after the sensitization test, the therapeutic injections of the lens-antigen are begun. These should be given with a 10 c.c. glass syringe, 21 gauge needle, both thoroughly boiled; and usually

A

B



A.—Drawing of fundus, showing fat globules in the veins.

B.—Centrifugalized tube of citrated blood (2 drops of a 20 per cent. citrate solution) showing the relative volume of fat.—Bantin, page 144.

the upper arm is chosen as the site of the injection because of its convenience, though the leg, abdomen, or buttocks may be used, if the patient desires. Always the site of the injection is first painted with iodine, the injection given under the skin, then the iodine wiped off with alcohol. The first dose, as a rule, is 0.5 c.c.; in strong patients it may be 1 c.c. In women or feeble patients the dose is increased 0.5 c.c. each time, or 1 c.c. at a time in vigorous patients.

4. The injections should be given every day, gradually increasing the dose as indicated above 0.5 c.c. to 1 c.c. at a time until the maximum dose is reached: in women, about 8 c.c.; in men, about 10 c.c. Exceptionally, this dose may be considerably increased. The symptoms which indicate whether a full or maximum dose is being reached are: Shortly after the injections —a few moments—the patient complains of a slight dizziness or restlessness, or slight pain in the back or the stomach, at times with nausea. The dose should then be reduced 1 to 2 c.c., and held at that for a week or ten days, when it can again be gradually increased to toleration. The patient should always remain in the waiting room five to ten minutes after each injection. Fifty doses constitute a course of treatment, extending over a period of about two months.

5. During the course of injections the patient is placed on small doses of potassium iodide, ten to fifteen drops of the saturated solution in a full glass of water at meal time. If the potassium iodide is not tolerated, the syrup of hydriodic acid, one teaspoonful in a little water, one-half hour before meals, is given. Also during the course of treatment the patient is instructed to have as nearly a salt-free diet as is possible. All patients are treated ambulantly, and allowed to use their eyes moderately at their ordinary vocations. In feeble or rundown patients general tonics are desirable.

6. The lens-antigen extract when not in use should be kept in a cool place in an icebox, but not on the ice.

Just before use, especially when the larger doses are reached, the solution should be slightly warmed—the chill taken off.

7. Local reactions on the site of the injections are considerable at times, especially toward the close of the treatments; the arm becomes red, swollen, with much itching; the second arm or leg or other site may be chosen, if the reaction is too great. These local conditions, while disagreeable, are not undesirable.

8. In patients where the treatments have been interrupted for as long as two weeks the sensitization test should be repeated to decide if the patient has become hypersensitive to the lens-protein, otherwise marked anaphylactic changes might be produced with harm to the patient. If not hypersensitive, the injections should be resumed, but with the smallest dose, 0.5 c.c. to 1 c.c., and gradually increased as in the beginning.

Method of Preparation of Lens-Antigen.—Beef eyes are employed. On receipt the lenses are removed and placed in salt solution containing 0.5 per cent. sodium bicarbonate and 0.5 per cent. phenol, in the proportion of 5 lenses to each 100 c.c. The lenses are thoroughly broken up in this solution and allowed to stand in cold storage for several days. The material is now centrifuged, paper filtered in cold storage, passed through a coarse earthenware candle and then through two or three fine candles to insure sterility. Each bulk bottle is tested for sterility. When shown sterile the material is filled into the market container, which is again tested for sterility according to the hygienic laboratory standards. The protein content of the solution so prepared is about 2 per cent.

Preventive Treatment of Cataract. Borsch[8] believes that opacities of the crystalline lens are frequently due to ocular toxemia from the absorption of toxins from the stomatogastro-intestinal tract, and car-

(8) Rev. gen. d'opht., 1925, 39, 246.

ried by the blood vessels or lymphatics to the different organs, as also to the eye, where they cause diminution of the resistance of the tissues and favor the formation of opacities. Errors of refraction, by the ocular fatigue which they induce, also cause slight but continuous congestion, which likewise predisposes to the development of opacities. Such errors of refraction must not only be carefully corrected but glasses with the property of filtering the irritant rays should be prescribed. He recommends treatment looking to gastrointestinal, dental and tonsillar disinfection, and local treatment by ocular douching with astringent, stimulating and antiseptic solution to favor the coagulation of the blood and lymph and the expulsion of toxins. He has found that such treatment frequently causes incipient opacities to disappear, retards presbyopia and prolongs the period of useful vision.

[With regard to the advisability of the use of conjunctival sutures in cataract extraction, the following case may be of interest. The eye had been previously treated for glaucoma, though at the time of the operation the tension was normal. A simple extraction was done, the section through the limbus, entirely in the cornea with no conjunctival flap. The lens was delivered with absolutely no vitreous loss. As the bandage was being applied the patient suddenly had an attack of propulsive vomiting. The bandage was not removed in spite of the fact that she had a second vomiting attack on her way to her room from the operating room. The bandage was not removed until the ninth day. The eye was completely healed and with the correcting lenses she has 20/20 vision. If, under conditions like this, such a satisfactory result can be obtained without employing sutures, it seems to us that they should be used under only most exceptional conditions.—Ed.]

Hereditary Dislocation of Lens. In the group studied by E. P. Cameron,[9] there have been fourteen persons of

(9) J. A. M. A., Aug. 21, 1926.

the same family affected, of whom only one was a male. Five have had to be trained in institutions for the blind. In every case, both lenses have been dislocated, the vision has been seriously affected and a squint, either convergent or divergent, has been apparent. Among those affected were the great-grandmother (an only child), four of the latter's six children (five girls and one boy); eight of the sixteen children of the four girls affected—but none of the six children of the unaffected girl and boy.

The Retina and Choroid

Diabetic Lipemia Retinalis and Fat Embolism. Lipemia is found more commonly in diabetes than in any other disease, and the blood lipoids have been found to be increased in practically all diabetic patients, even when the fat is not visible in the blood serum. It is said that the heaviest lipemia occurs only in severe active cases on a high fat diet, which naturally gives rise to acidosis. This lipemia is explained on the basis of a relative inability of the patient with diabetes to remove fat from the blood. This allows an accumulation of total fat, which has been reported as high as 26.25 per cent. The actual amount of fat in the blood serum in the case here reported by C. F. Bantin[1] was not determined, but such outstanding changes in the serum and in the retina make it certain that it exceeded the 8 per cent. mentioned by Gray and Root. (Plate XIV.)

The fat of lipemia ordinarily is in such a finely divided state that it is not visible as globules, even under the microscope. The state of aggregation of the fats or lipoids has more to do with the appearance of the retina than the total lipoid content, as retinal changes may be more marked at one time, with a lower total lipoid content, than at another time when the content is higher. Blood fat in its finely divided state passes

(1) J. A. M. A., Feb. 20, 1926.

through the capillaries without producing embolism, but when larger fat globules form or enter the blood stream, they give rise to fat embolism. In traumatic lipemia, these emboli lodge chiefly in the lungs, giving rise to pneumonia. Smaller globules may pass through the pulmonary capillaries and damage any organ in the body. Those lodging in the brain give rise to fever, convulsions, coma and death. Fat embolism from disease such as diabetes is usually limited to the pulmonary capillaries, causing no symptoms. This, together with the observation that diabetic coma may develop with clear plasma and low fat content, discredits the idea that the coma in diabetes is due to fat embolism. However, the ophthalmoscopic observation, in this case of fat droplets of considerable size and number flowing in the retinal veins necessitates an interpretation of fat embolism arising from so severe a diabetic lipemia. Thirty-three cases of lipemia retinalis have been reported.

Bantin's case was complicated with pneumonia and nephritis.

No previous record of actual fat globules having been seen in the veins has been found. White spaces, thought to be fat or plasma spaces, were observed microscopically in the capillary network at the base of the nails in a case of lipemia retinalis reported by McCann, but the retinal vessels did not show them.

Recovery from the acute diabetic symptoms was fairly prompt, illustrating well the value of the controlled use of insulin. Curves of insulin used daily and blood sugar determination were plotted. The pneumonic signs in the right base and the subsequent right abdominal symptoms and sepsis gradually cleared without operation.

Vascular Lesions of the Retina in Young Persons. Vascular lesions in late life have received much attention; H. Friedenwald[3] has made a study of

(3) Arch. Ophth., March, 1926.

vascular changes in young subjects. In the first group he includes cases of recurrent retinal and vitreous hemorrhages. He has recorded in a former paper definite changes in the caliber of the retinal vessels and especially of the veins, constrictions, dilatations, the formation of varices and of newly formed vessels projecting into the vitreous. Other observers have reported similar findings. Jackson and Finnoff have accepted completely the tuberculous nature of these changes and no other satisfactory explanation has been proposed. *Retinitis proliferans* is a common sequence. In the second group retinal disease with massive exudation and vascular anomalies are described, tortuous and engorged veins, aneurysmal dilatations and sclerosis of the vessels and perivasculitis. Coates ascribes the condition to vascular disease and hemorrhage into the external layers of the retina and their subsequent organization. In the third group acute circumscribed exudative chorio-retinitis, vascular disease, is sometimes observed. The author has reported a perivasculitis, showing itself in numerous white spots arranged along the sides or upon the surface of the vessels. This condition may be associated with hemorrhage into the retina and vitreous. In some conditions the vascular disease is the cause and in others the result of the retinal disease. The vascular changes in some cases may be congenital.

Melanosarcoma of the Choroid with Extension to the Orbit. In malignancy of the eye and its adnexa, radium used alone or as an adjunct to surgical measures has proved to be of incalculable benefit. Recent writers report prompt and lasting cures from its use.

Favorable results from this method of treatment have been reported in sarcoma of the conjunctiva, malignant lymphoma of the orbit, bilateral lymphadenoma, epithelioma of the cornea, melanosarcoma and even glioma of the retina.

Edward Stieren[5] reports a case of melanosarcoma

(5) J. A. M. A., Oct. 17, 1925.

of the choroid in which, after a generous enucleation had been performed and a laboratory report of melanosarcoma had been made, radium needles, 75 mg., were implanted deeply into the orbit, held in place with moist cotton sponges, left in situ five hours. As a result, the tissues in the bottom of the orbit became charred, and eventually sloughed out. Healthy granulations followed, and the orbit healed entirely in four months, when a glass eye was inserted, which has been worn with comfort and good cosmetic effect ever since.

There has been no local recurrence or distant metastasis up to the present time, nearly four years.

Black-Spot Choroiditis. Black-spot choroiditis according to R. D. Batten,[6] is a fundus disease which had not received due attention from either the clinician or the pathologist. It occurred in association with myopia, but was not peculiar to it, occurring, as it did sometimes, in people with hypermetropia. It was not confined to the macula, but he considered it was limited to the central area, that embraced by the superior and inferior temporal vessels. He recognized three forms of black-spot choroiditis. The generally recognized form was found, usually, in high myopia. In this the onset was acute, the process coming on with dramatic suddenness. There might be an accompanying hemorrhage, but in his experience hemorrhage had never been a marked feature. In another form of the condition the onset was not quite so acute, and the area of choroidal atrophy, after it had been formed, tended to get smaller, and the eye might regain some useful vision. In some of these patients there was seen first a blurred, edematous area, without any black spot being visible. Later a black spot appeared, a diffuse hemorrhage, with an area of atrophy around it. In yet another group a black spot was seen, but loss of vision was not a necessary accompaniment.

(6) Lancet, May 22, 1926.

Retino-Choroiditis Juxta-Papillaris. In 1908, Edmund Jensen[7] described a new form of chorioretinitis and mentioned the distinguishing features as: (1) occurs in early life; (2) without symptoms other than hazy vision; (3) the opthalmoscopic examination shows a single focus of infiltration near the disk edge; and (4) there is a sector defect of the visual field from papilla to periphery.

Jensen regarded it as primarily a disease of the retinal blood vessels later involving the retinal nerve fibers and choroid, because after disappearance of the infiltration one could recognize no atrophy or discloration of the papilla. He explained the defect of the visual field as produced by vascular obliteration, within the confines of the infiltration, and believed that perception was destroyed in that portion of the retina supplied by these vessels. Jensen regarded colds as an important factor in the causation of the disease which he designated as retino choroiditis juxta-papillaris. He reported four cases, in none of which was the fovea involved, in this respect differing from the later experience of several other observers.

In 1910, Verhoeff reported a pathological study of a case of syphilis of the eye involving especially the papilla, in which he demonstrated the spirochetes of Schaudinn and in 1916 he presented to the American Ophthalmological Society the first pathological study of an eye showing a lesion exactly like that described by Jensen, in that it was solitary, and affected most severely the nerve fiber layer, and the eye had many opacities of the vitreous. In describing this case, Verhoeff says:

"It differs from Jensen's case in the far greater intensity of the process, and in the occurrence of infiltration changes in the anterior part of the eye and in the existence of positive evidence of syphilis. It is evident, however, that if the case had been of a milder

(7) South. M. J., April, 1926.

type and the retinal lesion had ultimately healed, the condition prabably could not have been distinguished from Jensen's retinitis."

W. G. Harrison suggests that Jensen's disease is possibly just an ordinary chorioretinitis with a single focus in the retina near the disk margin and believes some are due to syphilis and some to other causes.

Sympathetic Ophthalmia

Not every case of cyclitis following injury, as pointed out by Hepburn,[4] even when keratitic precipitates are observed, is liable to cause sympathetic disease. How, then, are we to know which eyes can safely be left? Certain facts are undisputed. A penetrating injury which causes cyclitis, whether due to accident or operation, is occasionally followed after a few weeks by a cyclitis of the fellow eye which tends to progress to blindness and in the majority of cases is incurable. This catastrophy is at the present time exceedingly rare. probably owing to the improved standard of asepsis generally adopted in the treatment of wounds; it was almost unknown during the war. Nevertheless, it does occasionally occur, and until recently there has been no certain method of diagnosing which wounded eyes are liable to cause sympathetic disease and which are safe. The consensus of opinion among ophthalmic surgeons has been that those wounded eyes in which keratitic precipitates are observed are peculiarly dangerous, and it has generally been considered very risky for a patient with a wounded eye in which the symptoms of an active cyclitis have persisted for as long as three weeks to retain it, even if it still has useful vision. On the other hand, in the case where symptoms of cyclitis have already developed in the fellow eye, since the vision of the exciting eye may ultimately prove to be the better of the two, it is generally thought better to retain it. Obviously, the need is for some means of

(4) Lancet, July 31, 1926.

ascertaining which eyes are actually capable of conveying the infection of sympathetic cyclitis to their fellow. If nothing is done until there are actual signs that the second eye is affected, it may be—and according to some certainly will be—too late. On the other hand, there is now a general consensus of opinion against the possibility of sympathetic inflammation developing many years after an accident, so that we are justified in leaving this part of the subject behind us. If the condition of a wounded eye is obviously hopeless, or if there is no perception of light, it should, of course, be excised. For other cases there were formerly no satisfactory means of certain diagnosis. Recently there has been an improvement in this respect in two directions. It is well known that in certain protozoal diseases—notably syphilis and malaria—there is a definite change in the composition of the blood, the chief feature of which is a marked increase in the number of large mononuclear cells. Some years ago Browning began testing the blood in all cases of eye injury in which the danger of sympathetic disease was considered possible. It was found that in all cases in which the disease was really of a sympathetic nature an exact similar change in the blood count was observed—*i.e.*, a very marked increase in the number of large mononuclear cells. Acting on this knowledge, it is now customary to treat all cases of eye injury in which this particular condition is found very energetically with full doses of salvarsan or one of the similar arsenical injections. The other recent advance in diagnosis has been made possible by the high magnification under which details can be seen by the aid of the slit-lamp and microscopy of the living eye. Harrison Butler relies chiefly on this method in difficult cases in deciding whether or not to excise a wounded eye. When sympathetic disease is present, the slit-lamp shows the presence of albuminous matter in the aqueous. It reveals the presence and nature of keratitic

precipitates deposited on Descemet's membrane and the presence of cells in the fluid of the retro-lental space. He believes that by these signs it is possible to make a definite diagnosis. No one disputes that excision is not, in many cases, the only possible treatment or that in many others it is the only wise one. The point at issue is whether, once the diagnosis of sympathetic disease has been established, it is ever possible by any means other than excision to prevent the spread of the infection to the second eye. Some maintain that it is not. Others hold that sometimes it may be. As to the preliminary necessity of accurate diagnosis, there is no divergence of opinion, and Browning's method of the blood count should always be undertaken in doubtful cases. Where the test proves positive, the ophthalmic surgeon is faced with the responsibility of advising either excision or treatment with arsenical injections. In Browning's experience many cases have been treated successfully with arsenic even after the appearance of the beginning of cyclitis in the sympathizing eye. At any rate, it seems to be established that the success which has already attended this treatment is sufficiently remarkable to necessitate a revision of old ideas.

The Optic Nerve

Anatomically Irregular Sphenoidal Sinusitis with Optic Neuritis. The occurrence of so-called "canalicular optic neuritis," enlargement of the blind spot, and relative scotoma, due to pyogenic infection in the sphenoidal sinuses or posterior ethmoidal cells, or less frequently in the other nasal sinuses, is well recognized, and the detection of the infective focus by the suction syringe has been described by P. Watson-Williams.[8] The investigation of the sinuses in patients suffering from these optic nerve defects suspected to be of nasal origin sometimes present special difficulties, owing, on the one hand, to the absence of any visible purulent

(8) Lancet, Oct. 24, 1925.

discharge, and on the other to the irregular anatomical conformation of the sphenoidal sinuses and the ethmoid cells.

Thus, one sphenoidal sinus may be large and over-developed at the expense of the other, so that the large sinus extends far beyond the midline and consequently the small ill-developed sinus may be, so to speak, packed away into corner difficult of access. Again, the posterior ethmoidal cell may be unusually large and over-developed at the expense of the corresponding sphenoidal sinus, which may be so encroached on that the large ethmoidal cell occupies more or less the usual site of a sphenoidal sinus or it may lie above the sphenoidal sinus, much as a first floor room lies above the corresponding one on the ground floor. While these anatomical variations are of no moment in health, it is quite another matter when the sinuses become infected and the focal infection causes partial or complete loss of vision, or, may be, is the primary and essential cause of rheumatoid arthritis, neuritis, neurasthenia, unsoundness of mind, and so forth, any or all of which do occur. If there is plentiful purulent discharge the indications for opening and draining the involved sinuses are sufficiently plain, but unfortunately such cases are less frequently associated with the complications mentioned than are the cases where the discharge is slight, macroscopically nonpurulent, and often unnoticed until inquired into. It is therefore important to detect and to localize precisely the source of any infective focus and, when confronted with anatomical irregularities in these, relatively small deep-seated sinuses, to avoid overlooking the focus, an error which may cost the patient his sight or worse.

The author describes two cases which afford an interesting contrast; in the first the large sphenoidal sinus was infected and the smaller was sterile; in the second the large sinus was sterile and the small one, so difficult to locate, was highly infected. In the first case

the mistake was not detected until he was lead to make a further exploration. This helped him to avoid a similar mistake in the second, where the error would have been disastrous to the patient because the essential focus might have been unrelieved.

No means is known, other than that of the adaptation of the method of exploration by the sinus syringe, by which the focal infections could have been localized during life; while postmortem such localization could only have been of academic interest.

Ocular Phenomena Produced by Temporal Lobe Tumors. A detailed study of the ocular changes produced by temporal lobe tumors has been made by Walter I. Lillie,[9] in order to ascertain the frequency of correct localization from an ophthalmologic standpoint. Cushing's report that perimetric field defects in temporal lobe lesions were of paramount diagnostic value, localizing definitely the site of thirty-three of thirty-nine tumors of the temporal lobe, was a further stimulus to this study.

In a series of 168 cases of certified cerebral tumors examined in the Mayo Clinic during the last five years, sixty were located in the temporal lobes. In all but three of these cases, operation was performed; and in these three, the location was diagnosed correctly, as proved by necropsy. There were fifty-three cases of infiltrating gliomas, three of dural endotheliomas, two of calcified hematomas, and two of angiomas.

The ocular changes may be divided into four groups: (1) changes of visual acuity; (2) changes of the optic disks; (3) changes in the perimetric fields, and (4) oculomotor changes.

Changes in Visual Acuity.—The vision was normal in thirty-two cases, and not determined in nine. In the remaining nineteen cases there was visual disturbance in one or both eyes; in four of these cases there was a history of poor vision in one eye. The vision was

(9) J. A. M. A., Nov. 7, 1925.

moderately reduced in two cases in which the fundi were normal, and in one in which there was a mild pallor of both disks. The vision in these three cases was improved by proper glasses. In the remaining twelve cases, the visual decrease was probably due to a beginning secondary optic atrophy, resulting from the bilateral choking of the disks.

Changes in the Optic Disks.—In forty-five cases there were bilateral choked disks ranging from one-half to 7 diopters swelling. The choking of the disk was higher on the contralateral side as often as on the homolateral side. The choking of the disk was equal in twenty-four cases. In one case there was a definite bilateral secondary optic atrophy without edema, at first examination. In thirteen cases the fundi were normal, and in one there was mild pallor of both disks. In all the cases examined, except those in which the fundi were normal and one in which there was mild pallor of the disks, enlarged blind spots were noted.

Changes in the Perimetric Fields.—The field changes may be classified into (1) normal fields, (2) homonymous quadrant defects for colors, and forms and colors, and (3) homonymous hemianopia for colors, and form and colors.

1. In eight cases the perimetric fields were normal, both for colors and for form. In three of these the blind spots were enlarged, owing to the choking of the disks; the other five had normal fundi. All the eight cases were infiltrating gliomas, except one, which was a calcified hematoma.

2. There were ten cases of quadrant defect for one or more colors, the defect being in the upper quadrant in six cases, and in the lower quadrant in four. Homonymous quadrant defects for form and colors were present in fifteen cases, nine in the lower quadrant and six in the upper.

3. Homonymous hemianopia for colors with form fields normal was present in three cases, while a com-

plete homonymous hemianopia for colors and form was found in fifteen cases. In one case there was a complete macula preservation.

Perimetric fields were not obtainable in nine cases because of the mental condition of the patient. In eleven cases of definite aphasia, nine homonymous quadrant defects for form and colors were accurately charted by a simple procedure. Instead of relying on the patient to tell when the object or color is seen, he should be instructed to tap the table as soon as he sees the moving object or the color just named. In this manner a very accurate defect can be elicited if present. Such defects can be verified by repeated examinations.

In this series of sixty cases, seventeen were definitely localized by the perimetric field defects only, as the neurologic findings were only general in character. In contrast, fifteen cases were definitely localized by the neurologic examination, while the ophthalmologic examination was of no localizing value. In six of these cases, the fields were normal; and in nine, the fields were not obtainable owing to the mental condition of the patient.

Definite localization as to the site of the lesion was possible in forty-three of the sixty cases, from definite perimetric field defects alone, while definite localization was possible in forty of the sixty cases from the neurologic examination alone.

Oculomotor Changes.—The oculomotor changes were less common. There was paresis of the left abducens in six cases, ptosis of the left upper lid in two, partial external and internal ophthalmoplegia in two, and convergence weakness in three. All the oculomotor changes, except the convergence weakness, were located on the left side, but the tumors were equal on the two sides. The cause of this is not known, as the tumors were nearly equally divided, thirty-four in the left lobe and twenty-six in the right.

The neurologic findings, in order of frequency, are: generalized convulsions, partial hemiplegia, transitory numbness of arm or leg, aphasia, jacksonian convulsions, unilateral incoordination, uncinate attacks, and hallucinations of taste and smell. None of the cases presented visual hallucinations of any type.

Nothing of localizing value was shown from the roentgenograms of the head, except in the three cases of endotheliomas and in two of calcified hematomas. There were fifteen cases of enlarged sella turcica with and without erosion of the posterior clinoid processes. The remaining cases were negative. The enlargement of the sella turcica is of no clinical importance when associated with bilateral choked disks, except that it is another sign of increased intracranial pressure. Although the enlargement is present in 25 per cent. of these cases, it is also present in about 50 to 60 per cent. of cases of lesions of the posterior fossae, especially the cerebellar. In chiasmal lesions, the sella turcica is enlarged and eroded in about 65 per cent. of the cases, but a lesion in this region is rarely associated with a bilateral choked disk.

The ocular changes characteristic of temporal lobe tumors are found in the perimetric fields. In the early cases, the homonymous quadrant defects either for colors or for form or for both are common enough to be of great clinical significance, especially if these defects are associated with bilateral choked disks. This was true in forty-three out of fifty-one cases in the series in which the perimetric fields could be charted. No scotomatous defects were found.

These findings agree closely with those published by Cushing in 1921, except for the absence of visual hallucinations in this series of cases. If the homonymous quadrant defect is added to the syndrome of Kennedy, a definite syndrome can be established for temporal lobe lesions.

Conclusions:

1. Temporal lobe tumors are common (sixty out of 168 verified cerebral tumors).

2. Homonymous quadrant defects, either for colors or for form, associated with bilateral choked disks, are characteristic of this location (forty-three out of fifty-one cases).

3. The choking of the disk was higher on the contralateral side as often as on the homolateral side.

4. Visual hallucinations were absent.

5. An ocular syndrome could be established for early temporal lobe tumors; namely, normal visual acuity, bilateral choked disks, and homonymous quadrant defects either for colors or form.

The Surgical Significance of a Choked Disk. The modern electric ophthalmoscope should result in a wide appreciation of intra-ocular conditions. Unfortunately this appreciation is slow to arrive, and it will probably await the activity in practice of the present generation of medical students, since it is difficult for the general practitioner to add to his armamentarium an instrument in the use of which he is untrained. This is unfortunate for those patients who suffer from obscure conditions in which there are early intra-ocular signs recognizable by ophthalmoscopy. It is particularly unfortunate in relation to those patients who suffer from an increase in intracranial pressure and in whom a continuation of this pressure may result in blindness. It is not necessary that every doctor be able to recognize all retinal conditions, but a sufficient familiarity with the ophthalmoscope to enable him to recognize papilloedema (choked disk) would often prevent the practice of undesirable and even harmful therapy.

In an article discussing various varieties of brain tumor, E. C. Cutler[1] emphasizes particularly the importance of recognizing the physical sign—papilloedema. The triad of headache, vomiting, and blurring

(1) Ohio State M. J., August, 1926.

of vision are the classical signs of increased intracranial pressure. These symptoms, however, may occur with far less serious lesions than brain tumors; indeed, headache is about the most frequently elicited symptom in the practice of medicine. If, however, in addition to these symptoms, papilloedema is present, the diagnostic possibilities are at once restricted to a very limited number of pathological conditions. In fact we may say that with these findings brain tumor should be suspected until disproved. Papilloedema due to toxic substances may exist. Certainly it does occur in nephritis and perhaps in cases of severe anemia. This observer has made a study to determine what per cent. of patients with a choked disk showed lesions other than tumor. Over a period of 10 years, there were 183 patients other than those with brain tumor who presented a condition considered as a possible cause of papilloedema. Of these, 44 were due to tumor equivalents: arachnoiditis, oxycephaly, or pachymeningitis hemorrhagica interna. The remaining 139 could be divided into seven conditions as follows: sinusitis, arteriosclerosis, encephalitis, tuberculous meningitis, meningo-encephalitis, intracranial aneurism, or cerebral thrombosis. Of these 139 cases, 13 showed papilloedema, or 9.4 per cent. This is a very small figure compared to the percentage of brain tumor cases with choked disk, 80 to 90 per cent. We may safely state that choked disk most frequently results from increased intracranial tension in cases of brain tumor. This increased tension is due in part to the bulk of the tumor, in part to local edema, but chiefly to an interference with the balance of the cerebrospinal fluid circulation. Direct pressure of a tumor on the optic nerves is only rarely the important factor in the production of a choked disk.

"Almost all patients with brain tumor admitted to a surgical clinic have a choked disk." Unfortunately in a large percentage of such cases the pressure phenom-

enon has been exerted over such a long period of time or to such an extent that vision has already been permanently impaired. In Cushing's selected series of thirty acoustic neuromas only four cases could be said to have been referred for surgical therapy before the impairment of vision had become advanced. If such a situation exists in a clinic to which, because of the reputation of its chief, all sorts of intracranial cases are referred even on early susupicion, how much worse is the situation elsewhere. The modern electric ophthalmoscope should be a part of every practitioner's armamentarium.

In order to appreciate papilloedema, we must understand the physiology of the cerebrospinal fluid. It is generally accepted that the major portion of this fluid is secreted by the choroid plexuses into the several ventricles although there may be slight accessions to it from the perivascular spaces. The fluid finally escapes from the ventricular system by way of the foramina of Magendie and Luschka into the subarachnoid spaces, and, after bathing the central nervous system, is absorbed back into the circulatory system by way of the arachnoid villi which are most numerous and well developed along the sides of the longitudinal sinus over the vertex of the brain. We should remember that this is an active circulation. In cases of hydrocephalus following the removal of fluid, as much as 200 to 300 c.c. may reaccumulate in less than twenty-four hours. Frazier estimates the total amount of fluid secreted in twenty-four hours to be from 360 to 720 c.c. Thus, the total amount, 60 to 150 c.c., is replaced every three or four hours. Moreover, if phenolsulphonthalein is injected into the ventricles, over 60 per cent. is recovered from the urine within two hours. The choroid plexus has a definitely selective action; it is not a simple filter. It is impermeable to many drugs, hexamethylenamin being one of the few to pass the barrier; potassium iodide does not. Many toxins and mineral

substances found in the blood stream fail to pass this barrier. It is a complete circulation, delicately balanced, easily traumatized, and of course interfered with in every type of intracranial disorder.

With this conception of the cerebrospinal circulation, it is far more easy to interpret many of the phenomena that accompany brain tumor, particularly the sudden occurrence of greatly increased intracranial pressure in posterior fossa lesions. This conception furthermore allows one to readily appreciate the value of the therapeutic intravenous injection of hypertonic salt solution. Such an injection creates a condition of hypertonicity in the general circulation that at once results in the attraction of any available fluid into the blood stream. The brain, and especially the cerebrospinal fluid, share in this depletion. More recently it has been shown that saline purgatives by mouth produce the same effect, though probably not to the same extent, and this readily available method for reduction of intracranial pressure should be widely disseminated.

The relation of proper examination of the eye in all cases of intracranial disorder cannot be over-emphasized. The finding of a choked disk necessitates the consideration of brain tumor as a diagnosis unless it can be disproved. The early recognition of a choked disk or primary optic atrophy in cases with symptoms of intracranial disorders will be a great step in advance. It may insure proper therapy at a time when surgery can be of some real avail, and it certainly will permit at least temporizing measures that may save vision.

Cerebral Aneurysm Causing Ocular Symptoms. J. A. Conway[2] reminds his readers that cerebral aneurysm is of frequent occurrence. Osler found twelve cases in eight hundred autopsies and Newton Pitt found nineteen in nine thousand inspections. They may cause no clinical symptoms or they may rupture and cause

(2) Brit. J. Ophth., February, 1926.

death. Q.D., aged twenty-three, was regarded as suffering from pituitary tumor. He suffered from attacks of pain in the head for eight months. The right pupil was larger than the left and both disks were pale. Vision was extremely bad; he had bitemporal hemianopsia. Later he recovered from his blindness and resumed work. A few months later he died suddenly. At the *post-mortem* examination there was free blood under the *dura mater* and the *sella turcica* was filled by an aneurysm. A second patient, a woman of forty, suffered for two years with pain in the back of the neck, headache, dizziness and defective vision. Shortly after admission to hospital she became stuporous. There was right facial palsy with paresis of the left arm and leg, the right pupil was larger than the left and she had double optic neuritis. A diagnosis of cerebellar tumor was made. The autopsy revealed an aneurysm of the left vertebral artery invading the cerebellum chiefly. In many cases there is congenital weakness of the vessel walls.

Bilateral Optic Neuritis from Menstrual Disturbance. Some authors refer to menstrual disturbances as an occasional cause of optic neuritis, others disregard menstrual conditions as a possible cause.

S. G. Dabney[4] reports the case of an eleven-year-old girl, whose vision in one eye was reduced to 4/200. Vision in the other eye was normal.

Pupillary reactions normal, motility of the eyes normal, no diplopia. Ophthalmoscopic examination of the eye with poor sight demonstrated a well-marked optic neuritis. There were no hemorrhages into the retina and no retinal exudate. The patient had had no headache, no vomiting, no momentary unconsciousness, no disturbance of motion or sensation. She had no disturbance of the ocular muscles at any time. The globe tension was normal and the field of vision normal. The

(4) Kentucky M. J., May, 1926.

other eye at that time showed a little distention of the veins.

Wassermann reaction of the blood, and roentgen-ray examination of the nasal accessory sinuses were negative. The teeth were negative, and tonsils and adenoids had been nicely removed.

The causes to be considered were: brain tumor, lues, accessory sinus disease and focal infection. The history, the absence of so many cardinal symptoms, the negative Wassermann reaction and the roentgen-ray picture seemed to exclude all of these, and he concluded it was a case of optic neuritis due to menstrual disturbances with rather favorable prognosis. Treatment for the menstrual condition was given.

The improvement in the involved eye was rather rapid, and within a few weeks the patient's sight was restored to nearly normal. About that time she developed optic neuritis in the other eye. The same symptoms were manifest. There was no retinitis, no hemorrhage, and practically a negative history for all other symptoms. The child improved again and her sight is now practically restored to normal in both eyes.

Diabetes and Tobacco Amblyopia. It is universally admitted, indeed definitely established, that the optic nerves of the subjects of diabetes are peculiarly susceptible to the deleterious influences of tobacco.

This evil influence of tobacco, although well known by ophthalmologists, seems to have escaped general attention. Also it is worth while to endeavor to portray the characters of a scotoma due to diabetic chronic axial neuritis, or degeneration, and of one due to the toxic influence of tobacco and alcohol in a diabetic subject.

Observations beginning thirty-four years ago indicate that the scotomas of tobacco amblyopia have distinctive features which serve in most instances to distinguish them from other toxic scotomas in the central area of the field.

These distinctive features may be summarized, omitting fine details and distinctions, as follows: They are typically cecocentral defects with sloping margins; they are never truly central, or, more accurately, pericentral, and the term "central" in descriptive relationship to them should, as Sattler properly contends, be abandoned—they are papillo-macular scotomas in terpreting a conduction-interference; they often present one or two spots of greater intensity within their areas; the spot of greatest intensity does not usually cover the fixation point, as Sattler points out, but often, as Traquair's records show, may lie where one only is demonstrable between the fixation point and the blind spot, or if two are present, one may be at the outer side of the fixation point and another at the nasal side of the blind spot; and the excess of the defect for red, to use Traquair's phrase, over that for white is noteworthy.

Naturally, the scotomatous areas vary according to stages of the process—the stage of onset, the stage of progression and the stage of "breaking through," *i. e.*, the color defect reaches the limit of the red field above. Along these lines Doyne developed his three types—a large scotoma which involves the blind spot and the area between it and the fixation, stopping just short of the latter, and almost never passing more than 3 to 6 degrees beyond it on the nasal side; a scotoma close to the fixation point, connected by a relative area to the blind spot, which may or may not extend to fixation; and a scotomatous finger pointing from the blind spot toward fixation.

The vulnerability to the toxic effects of smoking, even in moderate degree, exhibited by diabetics makes it difficult in any case of so-called diabetic amblyopia, associated with scotomas, to determine which is the more potent factor, the diabetes or the tobacco or tobacco-alcohol, unless we admit that careful analytic perimetry develops features which in so far as the

tobacco-scotoma is concerned are distinctive: and this demonstration, in most instances is possible.

The cases in which the influence of tobacco can positively be eliminated are comparatively few in number, as even a casual examination of reported cases indicates. In the recent experiences of G. E. de Schweinitz and A. G. Fewell,[5] they cannot find one where this toxemia was not in evidence. But there are cases on record, such, for example, as have been described by Wilbrand and Saenger, by Kako, by Reber, and by Foster Moore, in which apparently the diabetic poison was the sole cause.

Wilbrand and Saenger state that the diabetic scotoma is pericentral, but may be horizontally oval, as it was in the right eye of one of their patients who came to autopsy, and who showed degeneration of the papillo-macular bundle: he had complete color loss in all parts of the field, and the central defect was absolute.

In one of the series of charts published by Traquair in his "Doyne Lecture" (1923) the scotoma is oval and ceco-central, but it and other field conditions differ from those caused by tobacco (Fig. 17). Kako makes the statement that the real diabetic scotoma presents early a large blue-blind area, which on the authority of Uhthoff, so he says, is rare in the tobacco defects, and that it is associated with a greater failure of direct vision than that which obtains in the tobacco cases.

The authors describe the cases of three diabetics, one of long standing, one of four years' duration, and one of mild type of one year's continuance, were all heavy smokers. One had used no alcohol for twenty years, one took "his daily drink," whatever that may mean, and one drank practically no alcohol. One increased his smoking when his sight failed, one continued his customary tobacco habit ("heavy pipe smoking") after his vision commenced to deteriorate, and

(5) Therapeutic Gazette, Sept. 15, 1926.

one was told "to continue as he was doing," although he had a history of diabetes (he was, however, sugar-free when he was examined)—a direction which evidently he felt did not include abstinence from tobacco.

Fig. 17.—Centrocecal defect in diabetes. 2, 20/2000 bilateral; fields otherwise normal. "A tobacco scotoma of this intensity is associated with diffuse depression of the central field." (Traquair in Doyne Lecture.)

Had these three patients, and they are only a few of those whose histories might be utilized, been informed as to the deleterious optic nerve influence of tobacco in these circumstances, it is reasonable to assume that they would have escaped the toxic amblyopia from which they suffered. Apparently this influence is potent, not only when the diabetes represents a severe type, but also when the disease presents itself in mild manifestation.

This relationship of diabetes to tobacco amblyopia is emphasized because although ophthalmologically well known and often described, it evidently does not find the place it deserves in the prescribed course of treatment suited to the diabetic state.

The non-identity of a scotoma caused by diabetes alone and of one due to tobacco in a diabetic subject, as elucidated by methods of exact perimetry, is not only interesting, but from the therapeutic standpoint

important. Small progress in the treatment of so-called diabetic amblyopia can be made unless this distinction is realized. As Traquair writes: "In cases of general disease, such as diabetes, in smokers, we shall be correct in most cases in attributing the amblyopia to the tobacco if the scotoma is typical." That the scotoma usually is typical, that is, presents distinctive features, the charts presented demonstrate. If, again to quote Traquair, "the intense part of the defect extends considerably to the nasal side of the fixation point, or is localized above it or below it, or if the scotoma is definitely asymmetrical, or of the pericentral type in one or both fields, or sharply defined with steep edges and a high or relatively uniform intensity," a cause other than tobacco should be suspected—for instance, diabetes.

Inflammatory Pseudo-Tumor of the Orbit. Inflammatory pseudo-tumor of the orbit is described by F. A. Williamson-Noble[6] as a condition which so closely resembles an orbital tumor as to be indistinguishable from it, giving rise to proptosis and limitation of movement. Birch-Hirschfield divides them into three groups. In the first of these are those cases in which recovery occurs spontaneously or with the adminstration of potassium iodid. In the second group are those in which an operation is performed and in which no tumor is found and the third group includes those in which the macroscopical appearance of the orbital contents suggests a tumor, but the microscopical appearances prove the lesion to be inflammatory. Three cases are described. The first patient was a man of twenty-five with proptosis of the right eye. Treatment with potassium iodid and mercurial inunctions failing to cure the condition, exenteration was performed. The orbital mass proved to be a gumma. The second patient was a middle-aged man with both eyes prominent and definite proptosis of the left eye associated with

(6) Brit. J. Ophth., February, 1926.

diplopia. His trouble followed influenza. A corneal ulcer developed, the eye was removed and the orbit exenterated. Examination of the mass revealed lymphocytic proliferation due to inflammatory change associated with the appearance of a lymphoma, the one to a certain extent merging into the other. The third case is an example of a small mass of young connective tissue forming outside the sclera as a result of irritation induced by the presence of cholestrin crystals.

Glaucoma

The History of Glaucoma. W. H. Cabaniss[7] gives an interesting historical resume of glaucoma.

The term glaucoma is of great antiquity but the ancient writers did not know its early stages nor did they recognize it as a distinct disease and, from the time of Hippocrates to the early part of the 18th century, it included cataract as well as other states.

Hippocrates used the term "glaucosis" and it is thought that he was then referring to a cataractous condition. The Greco-Roman writers described a condition of blindness in which the pupil was light blue or sea green and they supposed the change due to the flowing down of an inspissated humor into an imaginary space between the pupil and the lens.

The next important clarification of ideas occurred when Rolfinch in 1656 and, later, Brisseau and Maitre Jan pointed out that cataract is essentially a clouding of the crystalline lens. However, no one had advanced the fact that glaucoma is a condition of increased tension until Muller and Von Graefe did so.

Brisseaus demonstrated by his postmortem examinations that glaucoma is not due to an affection of the lens but was, in his opinion, a disease of turbidity of the vitreous humor.

Terson, in an account of his researches concerning the earliest mention of hardness of the eye in glau-

(7) J. M. A. Georgia, June, 1926.

coma, states that J. Platner, in a work published in 1745 in which he ascribed certain cases of glaucoma to an affection of the crystalline lens, gave evidence of his knowledge of the hardness of the globe to finger pressure.

More careful discrimination was shown in the succeeding years of that century, so that by 1821, Demours referred to the increase of tension and associated glaucoma with over-sensitiveness of the nervous system but ascribed the disease to rheumatism and gout. Yet it was not until 1830 that Mackenzie observed that hardness of the globe and an increase of the contents of the eye were accompaniments of the condition of what was by this time denominated glaucoma.

In the succeeding twenty years, many hypotheses were advanced as to the cause. Many believed it due to disease of the retina or optic nerve, while others, among whom was Mackenzie, ascribed it to be an affection of the choroid. Nothing had been devised to relieve the symptoms and the prognosis remained unfavorable.

Moreover it was not until the invention of the ophthalmoscope that it became possible to recognize the noninflammatory types and to study the morbid changes in the fundus.

In 1854 Mackenzie advised that "paracentesis of the cornea, or of the sclerotic, affords great relief of pain." Van Graefe had noticed in his studies of other conditions that iridectomy usually caused a permanent lowering of the tension and he advised that this be done in glaucoma. This was an epoch in the treatment of glaucoma and remains today as the most promising method for the relief of increased tension.

In 1856 Muller demonstrated anatomically the pressure excavation of the optic nerve and, a year or so later, Weber and Forster accurately diagnosed it with the aid of the ophthalmoscope.

There were numerous theories advanced regarding the causative factors of glaucoma. Donders believed

inflammatory glaucoma to be caused by an irritation of the secretory nerves of the eye while others thought the increased tension due indirectly to trigeminal neuralgia. Still others regarded it as an effect of angioneurosis.

In the last quarter of the nineteenth century this condition was studied with infinite care and the atmosphere became clearer as histologic methods were improved and especially through the careful study of eyes removed because of secondary glaucoma.

Leber believed that the cause lay in an obstruction of the angle of the anterior chamber. His researches were amply corroborated by Knies and Weber and their conclusions are universally accepted.

Priestly Smith, confining his studies to the changes observed in the crystalline lens during life, in 1879 advanced the theory that primary glaucoma is caused by an increase in the size of the lens or rather in a disproportion between the lens and the eye.

The Responsibility of the General Practitioner in the Diagnosis of Glaucoma. Acute glaucoma is a condition of extreme importance, not only to the patient and the oculist, but the general practitioner as well, because the responsibility of making a correct diagnosis and instituting appropriate treatment, many times will devolve primarily upon the family physician. It falls to his lot ordinarily to see the patient first, and it is in the early stage of acute glaucoma that the greatest good can be accomplished by an accurate diagnosis and by judicious management. There is no other condition that requires so imperatively correct treatment from the the beginning, because if incorrect management is employed, either in the way of active applications or a dilatory practice, disastrous results that cannot be overcome by any amount of subsequent diligence and care, may speedily follow.

It is especially important, as pointed out by J. O. McReynolds,[8] that this condition should not be con-

(8) Texas State J. Med., January, 1926.

founded with another condition with which, unfortunately, it is most likely to be confounded, namely, acute plastic iritis. The importance of this differentiation depends upon the fact that the treatment in these two conditions is diametrically opposed. In the case of acute congestive glaucoma, the great advantage to be sought is a speedy reduction in the tension, and this is accomplished most successfully by causing a marked contraction of the pupil, which results in pulling away the root of the iris from the filtration angle, thus opening up, to some extent, the spaces of Fontana and the canal of Schlemm: while the object to be accomplished in acute plastic iritis is just the reverse—a speedy dilatation of the pupil to prevent permanent adhesions between the iris and the anterior capsule of the lens.

This author considers the differential diagnosis of these two conditions under two general headings, the subjective manifestations and the objective manifestations.

The subjective manifestations are:

1. *Pain.*—The pain in acute congestive glaucoma quite resembles that in acute plastic iritis inasmuch as the pain is distributed not only in the region of the eyeball and the orbit, but over the entire side of the head. However, the pain is much more acute in its character, much more rapid in its development, and much more extensive in its distribution in acute congestive glaucoma. It is frequently mistaken for severe neuralgia, so the patient not infrequently comes to us with a history of having gone blind with neuralgia, when in reality he has gone blind with acute congestive glaucoma characterized by intense pain resembling neuralgia.

The constitutional manifestations are likewise more pronounced in acute glaucoma. There may be a distinct depression with nausea and vomiting, which seldom oc-

curs at the onset in acute iritis. In both of these conditions, the pain is deep-seated in character, because of the fact that it is produced by pressure upon the deep-seated sensory nerves of the globe, and is in marked contrast with the superficial, scratching pains that are present in conjunctival inflammation. While the pain is excruciating, the sensitiveness of the cornea to the touch of the finger is rapidly reduced in acute glaucoma, because of the paralyzing pressure upon the sensory nerves, but the sensitiveness of the cornea to the touch is preserved throughout the course of acute plastic iritis.

2. *Vision.*—The vision is speedily reduced, or actually annihilated, many times within a few hours, in cases of acute congestive glaucoma, on account of the rapid development of increased intra-ocular pressure interrupting the circulation within the globe, exerting marked pressure upon the optic nerve fibers as they come through the lamina cribrosa, and also by producing an edema of the cornea and a cloudiness of the other dioptric media. The vision in acute iritis is slightly diminished by the accumulation of plastic exudates in the line of vision, but this result does not rapidly supervene. In addition to the loss of central vision, there is frequently a reduction in the field of vision in acute glaucoma, which may be made out in the earliest stages of the trouble, particularly if there have ever been preceding acute atacks, or a preceding chronic glaucoma. This reduction in the field of vision may consist in a concentric limitation of the field with a special reduction on the nasal side, or with various forms of irregular scotomata. It may also be observed that in looking at a lighted lamp in a room, for instance, the patient may distinguish a kind of halo around the light somewhat resembling the appearance of a street light as looked at through a frosted window pane on a winter night. This halo is due to the cloudiness of the cornea produced by the edema con-

sequent upon the intra-ocular pressure, and it may assume the appearance of rainbow rings around the light.

3. *Discharge.*—There is no purulent, or muco-purulent discharge, as an essential feature of either acute glaucoma or acute iritis, because the pathological process is intra-ocular rather than extra-ocular. However, there is in both instances a profuse flow of tears.

The objective manifestations are:

In both of these diseases the eye is intensely red, but in acute glaucoma there is a more marked distinctness of the episcleral veins and anterior ciliary veins, so that they stand out in bold relief because of the interference with the return circulation occasioned by the intra-ocular pressure. The eye assumes a kind of purplish hue on account of the venous stasis. In acute iritis there is more of a diffused pink color surrounding the limbus and extending over the globe. In acute glaucoma the cornea rapidly assumes a steamy appearance, resembling a pane of glass that has been breathed upon, while in acute iritis the cornea remains perfectly clear. The pupil in both cases is relatively immobile, but is especially so in acute glaucoma, and in this condition is widely dilated, while in acute iritis the pupil is inactive but contracted, unless a mydriatic has been used, in which case the iris will show adhesions to the anterior capsule of the lens, giving an irregular outline to the margins of the pupil. The anterior chamber in acute glaucoma is much shallower than normal and may be entirely obliterated, the iris and the lens pressing against the cornea, while in acute iritis the depth of the anterior chamber is unaltered. If the media are sufficiently clear to permit of an ophthalmoscopic examination, the fundus in acute glaucoma will show some reduction in the caliber of the retinal arteries, with a marked increase in the caliber of the retinal veins, which are distinctly tortuous in their course, on account of the interference with the return circulation. There may be hemorrhages, also, espe-

cially of the venous type in acute glaucoma, and these are unusual in acute iritis. The optic disks, in acute glaucoma, if the condition has supervened upon a more or less chronic trouble, will show a marked excavation which is total in character and presents characteristic features that distinguish it from other forms of excavation of the optic disk. The entire lamina cribrosa is pushed backward by the intra-ocular pressure, so that the retinal vessels appear broken in their course over the rim of the sclera. While in atrophy of the optic nerve, there is a pallor of the disk and a slight diminution in the prominence of the disk, but with no actual recession of the lamina cribrosa. In a physiological excavation of the optic disc, the central portion may appear deeply excavated, while the peripheral portions, containing the normal number of normal optic nerve fibers, will show no such depression.

The essential condition of acute congestive glaucoma is the increase in intra-ocular pressure, and upon this one circumstance develop all of the symptoms enumerated. The eyeball may vary in hardness from a very small increase, capable of being appreciated by the touch, to those cases of extreme hardness in which the eyeball is apparently hard as marble. This intra-ocular pressure is variously estimated, by palpation with the fingers, or, more acurately, by a tonometer, which measures in millimeters of mercury the intra-ocular tension. In acute plastic iritis there is no increase of importance in the intra-ocular pressure.

Whenever a patient becomes suddenly blinded, or has his vision rapidly reduced, associated with pain radiating to the brow, the temple, and the side of the head, with a dilated pupil, with a shallow anterior chamber, with halos around the light, and with increased intra-ocular pressure, caution the patient to secure at once not dilatation of the pupil, but a contraction of the pupil, and follow this up with a careful investigation into the exact conditions. In all cases

of diminished vision no time should be lost in ascertaining, as accurately as possible, the exact situation, so that remedial measures may be adopted promptly and not indefinitely postponed in the vague hope of better days.

It is a matter of the utmost humanitarian and economic importance to secure vision for a patient when it is possible to do so rather than have the patient spend the final years of life in the fruitless waiting for complete blindness. This protracted delay simply results in the loss of general physical strength and endurance, so that when the patient finally reaches the stage of complete blindness he may be so enfeebled by the various infirmities of age that he is not in so favorable a condition for any kind of operation, and has such a poor remnant of life left that he may not have the courage and confidence and strength to undergo an operation for the restoration of sight, and thus, hesitating on the brink of the grave, passes on from the darkness of this world into the deeper darkness of the great unknown.

Prolonged Miosis for the Control of Increased Intra-ocular Tension, with Remarks on the Preparation of Solutions of the Miotics. In agreement with those—and they include the majority of ophthalmologists—who maintain that, other things being equal, a proper operation early performed is the method most likely, in the majority of instances, to yield the best results in the management of chronic glaucoma, we realize, as all of us must, that in a certain percentage of cases operation does not check the process, that sometimes degradation of vision is more rapid after a surgically correct procedure than prior to its performance, because increased intra-ocular tension is not the whole story of glaucoma; that operation may be inadvisable, or, indeed, impossible, on account of general as well as ocular conditions, and that some patients, although it is plainly indicated, positively decline to accept opera-

tion; and finally, that prolonged miosis without operation is capable of efficiency for a long time and may be needed as an adjunct to surgical interference. Hence, physostigmin (eserin) and pilocarpin maintain an important place in our therapy of chronic glaucoma. G. E. de Schweinitz and B. F. Baer[9] present some data as to the methods of preparing solutions of the miotics in order to avoid certain untoward conditions which they are capable of producing, and which may preclude the possibility of their continued employment.

Of these untoward conditions, a conspicuous and often troublesome one is the development of the well-known toxic conjunctivitis, characterized by the elaboration of follicular granulations and a moderate secretion, in many instances associated with edema and eczematous eruption on the lids and surrounding tissues.

Occasionally this conjunctivitis appears a short time after the instillation of the miotic solutions; usually a comparatively long period elapses before the inflammation manifests, and sometimes its advent is delayed for a great while, or does not at all appear.

It has been attributed to impurities in the solution, to the presence of free acid, to a fungoid growth, and to idiosyncrasy. Apparently it is more common in those patients who have an arthritic tendency, as was pointed out by Treacher Collins.

As instances of long-continued immunity, the cases are cited of three women who have used pilocarpin solution (of varying strengths) for 12, 14 and 16 years respectively, without the slightest evidence of conjunctival irritation; and one man who has employed eserin (oily solution, or suspension) for 16 years without the least indication of conjunctivitis. Any ophthalmologist in active practice can of course record similar experiences.

Exclusive of those patients who speedily, within a

(9) Therapeutic Gazette, July 10, 1926.

few days, or at least a week or two, exhibit conjunctival reaction even in violent degree, and who belong to the idiosyncrasy class, a real miotic conjunctivitis—that is, one where follicular granulations appear—usually requires some weeks or a few months for its development.

But it is also true that immunity may be maintained for years, when, the solutions and frequency of their application remaining the same, it breaks down, and the reaction, it may be rather suddenly, becomes tempestuously evident.

Miotic conjunctivitis is less apt to occur if pilocarpin hydrochlorid, or nitrate, is the selected drug than if any of the salts of physostigmin are employed in watery solutions, or if they and pilocarpin are both employed. It is also true that periods of immunity are often prolonged, or that untoward results are avoided, if the treatment begins with weak solutions of the drug and gradually the percentage-strength is increased. One may commence, for instance, as Posey has advocated, with 1 10 of a grain to the ounce, and slowly advance its strength, so that some months pass before a solution of 1 grain to the ounce is reached.

It is hardly necessary to say that the solution must be fresh, often renewed and sterilized. This is far better than trusting to the addition of antiseptic substances, for instance tricresol.

Every ophthalmologist could gather from his records the case histories of patients who have for years successfully maintained their glaucomatous eyes within the range of normal tension by miotic treatment. In the list of patients previously referred to there is one who has been under constant observation for twenty years, who has steadfastly declined operation, who has had a number of subacute attacks and four acute attacks, which have always yielded to increased dosage of mioties, and yet who, even now, has practically normal vision and normal intra-ocular tension.

In the case of another patient in this list the same happy result obtained for many years in one eye, but not in the other, in which the vision slowly disappeared; it was only one-half of normal when the treatment began.

On the other hand are those patients in whose eyes a normal tension has been maintained for years by means of miotics, for fifteen years in one case, when the miotic loses its control and the tension rises in spite of increased frequency of application and increased strength of the solution.

These are peculiarly dangerous cases because the patients are apt to neglect systematic examination, and only too often they report for investigation when the field of vision is greatly depreciated, even though direct vision may still be good.

Furthermore, in a fair percentage of cases of chronic glaucoma the failure of miotic control of increased intra-ocular tension may be evident, not in a slowly persisting rise of pressure without congestive signs, but in a sudden acute attack. For example, in the case of a patient with chronic glaucoma the tension remained in perfect control for sixteen years, when suddenly the right eye developed a violent attack of acute glaucoma which rapidly passed into the malignant type of the disease, with prompt destruction of vision, requiring enucleation of the globe. In two days an attack of acute glaucoma supervened in the left eye, fortunately entirely obviated by a peripheral iridectomy, vision and field of vision being normal more than a year since its performance.

Hence De Wecker's contention, long ago promulgated, that miotics cannot cure chronic glaucoma is practically justified, and we repeat the statement that operation according to one of the methods which secures a fistulous area is, in suitable circumstances, the best method of treating chronic glaucoma. Nevertheless, for the reasons previously stated, miotics are often re-

quired, and it may be for long periods of time. Therefore the best methods of preparing the liquid solutions of these remedies is a matter of importance.

Recently, J. W. England, the well-known pharmaceutical chemist, much interested in a patient with chronic glaucoma whose conjunctiva quickly reacted unfavorably to watery solutions of physostigmin and pilocarpin, writes as follows: "I have been making solutions of pilocarpin hydrochlorid and physostigmin sulphate with a special rose water, filtering through paper. The formula for the 'Special Rose Water (No. 1)' used is: Boric acid 18 grains and stronger rose water 4 fluid ounces. Dissolve the boric acid in the stronger rose water and filter into a sterile bottle. If the rose water is cloudy from supersaturation of volatile oil, mix with purified talc before filtration. To filter, use a glass funnel, with a flattened plug of absorbent cotton in the neck, and upon this rest the folded filter paper. Return the first portions of the filtrate if not absolutely clear.

"There is something more in rose water than the odor. It seems to be slightly anesthetic, however small the amount of oil in the rose water may be. The chief constituents of oil of rose are the alcohols geraniol and citronellol, the two together being present to the extent of 70 to 75 per cent., while the citronellol constitutes about one fourth of the liquid portion of the oil. Traces of esters of these alcohols are also present (B. P. C., 1923, 765).

"This 'Special Rose Water' can be still further improved by adding 0.85 per cent of sodium chloride—making it a physiological salt solution in rose water. The formula would be:

Boric acid, 18 grains;
Sodium chloride, 16 grains;
Stronger rose water, 4 fluid ounces.

Prepare as for Special Rose Water No. 1.

"My reason for advocating the addition of sodium

chloride is this: Many years ago, while experimenting with white of egg, I noticed that it was not wholly soluble in water. When 25 c.c. of egg-white was mixed with 75 c.c. of water in a 100-c.c. glass cylinder, and agitated, a glairy, insoluble mass of globulin remained suspended in the water. When, however, I added 0.85 per cent. of sodium chloride and agitated, a transparent solution immediately resulted. This was due to the fact that the sodium chloride made the globulin soluble in water."

Thus far, the solution recommended by England has been used only once, namely, in the treatment of the patient already referred to for whom it was prepared. The results achieved in this case were satisfactory.

Since this paper was read (February 18, 1926) one record of a trial of ··ngland's solution has been received, detailing an utter failure of the preparation to prevent miotic conjunctivitis, which, indeed, appeared only too promptly in most active manifestation.

[The use of eserin solution over somewhat long periods is necessary in certain cases. This often produces, in time, a marked twitching of the eyelid which is extremely annoying to the patient. In a number of such cases eserin ointment has been substituted for the solution, stopping the twitching and acting with equal efficiency in controlling the tension.—Ed.]

Ocular Tuberculosis

The Relationship of Tuberculosis to Certain Fundus Changes, Especially Periphlebitic Retinitis. The diagnosis of intra-ocular tuberculosis, as this applies to the fundus of the eye in the absence of characteristic iritic manifestations, is not always a simple matter, but on the contrary is frequently attended with many difficulties and that despite the most exhaustive examinations.

Of the choroidal types, the miliary form is probably the easiest of recognition, the conglomerate type and

the disseminated and exudative forms are in no sense as suggestive as far as etiology is concerned. A few cases are on record where a solitary tuberculosis tumor occurred at the nervehead.

In 1908 George Coates placed on record his excellent study of six cases of retinal disease with massive exudation and reviewed the literature of analogous cases. He referred to forms with and without gross vascular changes and among the cases reviewed there were a few that were associated with tuberculosis elsewhere in the body, several with an adenopathy and in a few instances a positive tuberculin reaction. When this exudative mass is peripheral, which it is occasionally, he points out that perhaps the usual clinical diagnosis is tubercle of the choroid, either active or obsolescent. The retinal exudate in this type of disease is deep, the course insidious, the individuals are usually young males who appear to be in excellent health and their personal and family histories are frequently negative.

Various observers have reported aneurysms of the retinal vessels where there was associated evidence of pulmonary tuberculosis. It is believed that the disease may be traced to a hereditary weakness of the blood vessels, of the nature of an angio-fibromatosis followed by retinal degeneration. A tuberculous origin is possible in these cases.

With these various fundus conditions in mind T. B. Holloway[1] calls attention to the difficulties of a positive diagnosis of tuberculosis in certain fundus pictures, and still further to emphasize not only the importance of a complete and exhaustive examination as this relates to the various branches of medicine, but also the necessity of it, if progress is to be made.

Let us remember, he says, that if we exclude congenital anomalies, refractive errors, the effects of radiant energy, neoplasms, and trauma, practically all of the intra-ocular manifestations encountered in ophthal-

(1) J. Iowa M. Soc., Dec. 10, 1925.

mology are secondary to pathologic changes affecting distant or adjacent parts. Therefore cooperation is essential, if the examinations are to be made which are so desirable in these cases.

While most of these debatable fundus conditions are of interest, few are more so than the type of retinitis that is associated with definite periphlebtic changes, usually peripheral, and not infrequently with hemorrhage into the vitreous which is often of recurrent type. It is usually observed in young individuals, runs a chronic course, and when associated with vitreous hemorrhage leads to a sudden loss of vision; it is apt to present a slowly but constantly changing picture and proliferative retinal changes are not uncommon.

In treating this condition, after all examinations have been completed, any focus of infection should be eliminated when this is possible and any systemic condition vigorously treated. Probably better results have followed the use of tuberculin than any other treatment, but the initial dose should be small. Fibrolysin and thyroid extract seem to have been of service in certain cases, but in connection with the use of the latter drug it may be well to recall that instances of vitreous hemorrhage of the nonrecurrent type have been recorded in cases of Graves disease. (Jeandelize, Bretagne and Richard, Y.-B., 1924). The iodids locally and internally as well as the local use of dionin may also be of service. Ormond has given a full review of the treatment of intra-ocular hemorrhage and his report may be referred to with profit.

The author has not made any use of foreign proteins in the treatment of these conditions.

Injuries and Foreign Bodies

Injuries to the Eye as Related to the Industrial Surgeon. Every industrial surgeon should be equipped to make a careful examination of the eyes—to use the ophthalmoscope and make the Snellen test.

Sydney Walker, Jr.,[2] who has had a large exprience

(2) Surg. J., April, 1926.

in industrial work, says that in making an examination of the average case the following points should be borne in mind: The history is of great importance and should not only include the history of the injury sustained but also of previous eye injuries. The vision test, which comes next, should be more or less routine and should be made of the uninjured eye first. There are several reasons for that. The average person who comes in does so with a fair and square mind but there are many who do not and therefore examining the uninjured eye first gives you an opportunity of finding out what the patient really sees. Inspection is next. This is accomplished in the average case by putting in one or two drops of cocain to relieve the blepharospasm and the tendency to squeeze the lids together and the natural tendency to shield the eye from the light. Inspection may reveal a foreign body, superficial laceration, slight to great injection and the condition of the upper culdesac. It may seem rather out of place but it is true that in the average patient with an inflamed eye in whom inspection shows no foreign body, two things are quite necessary, first, to turn the lid over, and second, to look at the culdesac, because a foreign body may lodge there, producing a superficial laceration of the cornea which will go on to ulceration. Probably one of the most useful things a man in industrial practice can do in an eye case is to instill a drop of 1 per cent. fluorescein. By this means even a slight superficial laceration, impossible to see with the naked eye, will become visible. The fluorescein can be washed out with sterile water. The next step is to take the finger tension. It is not expected that every industrial surgeon should have a tonometer. This is an instrument only used by ophthalmologists relatively rarely, but if possible one should ascertain the tension of the uninjured and injured eye as it brings out several things. Usually the points it does bring out are

median tears of the eyeball, tears through the conjunctiva. Naturally in severe contusions of the eyeball we have a great deal of lessened tension, but that gradually disappears and with that there is usually considerable blood in the anterior chamber on inspection.

With the industrial surgeon the ophthalmoscope will bring out many things. With just a plain mirror oftentimes it is possible to discover a small foreign body or a small abrasion or a small dent in the cornea from an examination with the ophthalmoscope at some distance. You can also determine at that time the partial formation of a traumatic cataract. Traumatic cataract can develop in anywhere from 10 minutes to days or weeks after, but taking the average case within a half-hour to an hour the industrial surgeon can often determine by inspection with the ophthalmoscope a beginning traumatic cataract. There are many other factors, such as cloudy vitreous, blebs in the vitreous due to blood extravasated by one means or another. There are also such conditions as dislocated lens discernable by this means.

The next point that comes up in industrial ophthalmology is the question of the malingerer. Approximately 3 per cent. of all industrial eye cases are fakers; they show a tendency to get just a little more than is coming to them. There are several tests that the industrial surgeon can use.

A patient comes in with an injured eye and is wearing glasses. It is quite important that the vision which you take should be without glasses and then with his correction.

Examination of old scars on the lens and cornea is of very great importance due to the fact that corneal scarring if it is not deep is of relative importance if it is in the periphery. If it is deep it can cause quite marked astigmatism; for example, even faint leukomas will distort the vision and will cause loss of sight.

The treatment of these cases naturally depends upon the injury and for this reason the diagnosis is of great importance. Ordinary simple foreign bodies on the cornea will require treatment depending on the depth at which the foreign body is lodged in or about the cornea. Taking a cross section of the eye, for example, we will see the superficial tissue lying on or in the epithelium. Foreign bodies in this area do not leave a scar and do not amount to much. Foreign bodies that go in as deep as the interstitial layer will always leave a scar, depending on the size and depth to which they penetrate, and so the average foreign body should be removed with as little traumatism as possible. Many cases are seen in which the "shop oculist," who is probably the greatest menace to the man, removes the foreign body with a penknife or the tip of his fingers, lacerating the cornea with resultant ulcer formation or rupture of an ulcer already present. If that person can be done away with, the number of eye injuries following foreign bodies will be greatly reduced. In the removal of the average superficial foreign body the process is not difficult. The hot foreign body is the one which causes a great deal of difficulty. The method of removing foreign bodies naturally depends on the type. If you have a steel, a magnet is good to use, due to the fact that you do not have to go in behind and damage the macular area. Furthermore, a magnet will pull out a foreign body relatively more easily than any other way.

In burns of all kinds, such as simple, acid, lime, and the like, homatropin should be used as first aid treatment, followed by oil. It does not matter what type of oil you use, vaseline or petrolatum. The best thing is plain White's ointment—1-3000 bichlorid in vaselin. The only after-care that is necessary in the average case is the care of the adhesions which may follow. Symblepharon, a tendency to entropion and things of that sort will need rather personal attention. It is sug-

gested that after a burn the upper and lower cul-de-sac should be watched rather carefully and any tendency toward adhesions of the eyeball should be promptly broken down to save complications later on.

Intra-ocular steel is probably one of the most difficult things to diagnose at times. The presence of intra-ocular steel is one of the hardest things to determine. For example, it is a well-known fact that steel can penetrate the cornea, go through the lens and into the vitreous and that a cataract will not develop for days, and this is due to the fact that not enough capsule has been opened to permit the aqueous to come in contact with the lens and produce a cataract. Oftentimes the *x*-ray fails in the diagnosis of steel. So if you suspect anything or if you feel there might be steel in the eyeball from the history or from looking at the eye or from the type of work done by the patient, do not hesitate to look for intra-ocular steel.

Probably the most dangerous type of ulcer the industrial surgeon has to handle is the infected ulcer with hypopion which has gotten a good start and which has spread toward the center of cornea and which ends up with partial loss of vision or total loss of the eye. An ulcer with hypopion is a hospital case. The treatment should be in conjunction at least with an ophthalmologist. The average corneal ulcer can be taken care of by atropin.

There are conditions which are seen by the industrial surgeon, for example, the different types of conjunctivitis. Those cases call for two things, treatment and compensation. Probably 75 per cent. of the cases of conjunctivitis are not compensative. Some, of course, are.

Trachoma, which is more prevalent than the average physician in industrial work thinks, is seen quite often and cases of more or less chronic trachoma with slight flare-ups are frequent.

As to the types of cataract which we have, cataract

from our standard is divided into two types, senile and traumatic. The senile cataract often causes a great deal of trouble and in a certain proportion of cases it comes to the Industrial Commission. A man of 50 years comes in and says his eyes were all right before, and after a trifling injury a cataract developed. Those cases are the ones which can be more or less saved by the industrial surgeon in their infancy. In other words, a man comes to the industrial surgeon and complains of an injury to the eye. If with an ophthalmoscope you can make a diagnosis of cataract you are saving your company a great deal. You will find that approximately 60 to 75 per cent. of cataracts in people over 50 to 60 years of age are not compensated but are senile cataracts.

The examination of a man who has had a skull or brain injury as far as his eyes are concerned is of great importance. The eye findings are the only findings in the average case of skull injury. Any structure of the eye or of the optic path may be involved in skull injuries; fractures of the skull are not necessary for such involvement; the severity of the concussion is not always the determining factor in the amount of ocular damage; ocular injuries are apt to result from skull fracture; ocular injuries from skull fracture are often overlooked due to many factors. The time limit of ocular involvement usually subsides within a definite period, but if it persists, malingering should be suspected. Ophthalmoscopic examination is indicated in all skull injuries no matter how trivial.

The Early Treatment of Eye Injuries. W. W. Wilkerson[3] states that in cases of cuts through the lids the sutures should be very deep and closely arranged. A tight bandage should be applied, for at best the sutures are prone to pull loose. Some prevent this pulling in vertical wounds by a canthotomy. Insect bites and

(3) J. Tennessee M. A., December, 1925.

bee stings of the lids are treated with most efficacy by the application of cold compresses.

Foreign bodies of the conjunctiva should be carefully removed, and the conjunctival sac freely irrigated with a mildly antiseptic solution. Small wounds are of little importance, but the larger wounds of the conjunctiva require suturing. Corrosions produced by acids should be treated with free irrigations of carbonate of soda solution, or ordinary cooking soda in solution; alkali burns should be treated with irrigations of milk; lime burns should be treated with instillation of oil into the conjunctival sac. Fuchs has recommended the use of a concentrated sugar solution in these cases. Burns of the conjunctiva require the additional use of some mildly antiseptic ointment and cold compresses. However, cold compresses should not be applied for more than fifteen minutes at one time for fear of chilling the cornea to a dangerous degree.

Burns of the cornea should be treated in a similar manner to those of the conjunctiva. In perforated wounds of the cornea in which the iris is protruding, the prolapsed iris should be removed and the remaining edges replaced in the anterior chamber. The size of the injury offers no index as to the prognosis; for if the wound becomes infected it may cause the loss of the eye. The safest plan is to cleanse thoroughly the conjunctival sac, touch the wounds of the cornea with three and one-half per cent. tincture of iodin, following this with the repeated use of antiseptic ointments and warm compresses. Attention must be paid to the lacrimal apparatus to prevent infection coming from that source. In all wounds extending through the cornea the patients should be placed in bed. Whenever the iris is involved one should immediately use atropin sulphate—2 per cent. in adults, being careful to obtain complete dilatation. Cleanliness—first, last, and always—is of greatest importance in these cases.

The treatment of wounds of the iris produced by

blunt instruments without perforation of the globe consists of pressure bandages, the application of cold compresses, and rest in bed. In perforated injuries the conjunctival sac must be carefully irrigated. Atropin sulphate should be used when the rent in the iris is located centrally, and pilocarpin muriate when located peripherally. Rest in bed and the application of cold compresses and later warm compresses is of utmost importance. Foreign bodies of the iris should be removed; iron and steel particles by the use of the magnet, if possible. Those foreign bodies which cannot be removed in that manner should be removed by the exclusion of the involved portion of the iris.

Ossification of the Eye. Lijó Pavía[4] has been able to find only two cases on record resembling the one he describes in which a traumatic injury of the eye was followed by ossification. In his case the injury had been a sensation as if an insect had crept under the lid. Four years later the enucleated eye showed not only the formation of bone tissue but also of nerve tissue (glia).

Blindness

The Diagnosis of Blindness. From a survey made by Edward Jackson[5] of 704 eyes blind, or near blind, from all the common causes of blindness, this fact stands out: Except in amblyopia, congenital or associated with squint, blindness is always associated with objective changes that declare the sight has been greatly impaired, and often furnish the most important evidence of how great that impairment is.

When there is a possibility that the patient may be malingering, it is of the utmost importance that the examiner should make a correct diagnosis of the actual condition, for, as this author says, a diagnosis is a decision, to be reached by careful consideration of all obtainable evidence.

(4) J. A. M. A., July 10, 1926.
(5) Ibid., Sep. 5, 1925.

In a military commander or an executive, indecision may be more disastrous than a wrong decision. For a physician or surgeon, it may be quite as serious in its consequences. In cases of blindness, a decision on the extent or the cause of blindness may be the only professional service we can render. Every attempt to assist, to train, to compensate or to make economic provision for the blind renders the diagnosis of blindness more important.

All human decisions are liable to error, but this does not make decision less important. Through ignorance of facts, distortion of them, prejudice, poor judgment, failure properly to appraise the relative value of evidence, wrong conclusions may be reached. This may be the case in military affairs or in executive business, with judges as to points of law, or juries in regard to matters of fact. But this does not relieve officers or executives, judges or juries from doing their best to reach a decision on the situation or the facts presented. It is equally the duty of the physician to reach a diagnosis, and especially of the ophthalmologist to reach a decision—a diagnosis—regarding blindness.

If he is too anxious to avoid criticism for apparent dogmatism, to make clear what he really believes is the truth, his statement may be of no service to truth, justice or science. It is enough in any case to preface his conclusions by the simple words, "I think," or "It is my conclusion." "I believe that this person or this eye is, or is not, blind; or that the blindness is, or is not, from this or that particular cause." To decline to reach and state a definite conclusion as to the existence, degree and etiology of blindness is, in most cases, equivalent to a confession of incompetence, laziness, or indifference to the question presented.

No opinion should be rendered regarding a case of blindness without seeking out and considering all the evidence bearing on it. But, having done this, it is a shirking of responsibility for any one holding himself

before the community as an expert as to diseases and defects of the eye and vision, to refuse to give a diagnosis as to blindness, or to state it in such doubtful terms as to render that diagnosis worthless.

It may be felt that, vision being subjective, no one but the individual himself can tell whether or not he is blind. It is equally true that the individual must generally know better than any one else whether he has committed a murder or theft, or planned and assisted in any crime, or really is justly entitled to some piece of property he has claimed. But as in any of those cases, the interest of the claimant in his alleged blindness often renders his testimony worthless. If his testimony is admitted, it gains significance and weight only as it is corroborated by collateral evidence over which the claimant's self interest has no vitiating influence. To elicit, weigh and present such unbiased evidence, and to estimate its value: in other words, to bring out and estimate the value of objective evidence of blindness is the business of the ophthalmologist.

It is to be regretted that the limited space in this volume prevents the reproduction in full of this excellent article. We shall allude to some of the features upon which he lays the most emphasis.

The diagnosis should answer these questions:

Is there blindness present?

How great is the impairment of sight?

What is the cause of it?

With what certainty and accuracy can these be answered by a careful and complete objective examination? Let us admit that the diagnosis of blindness is easiest, most certain and most exact when the cooperation of the patient brings to our assistance all the subjective evidence regarding vision. But when the patient or claimant will not so cooperate, will not give such assistance, and by refusal to work actively against what he conceives to be his interest, either by a general attiude of obstruction, or direct falsehood,

would prevent a correct or accurate diagnosis, what may we do to bring out the facts by complete and conscientious objective examination?

The answer to this question determines our ability to assist the community in excluding from certain occupations or branches of service those whose defective sight would endanger themselves, or impair their efficiency in those lines of service. It becomes more important with all legislation bearing on industrial insurance, compensation for injury, assistance, special privileges or benefit for blindness—directions in which the recognition of social responsibility has developed very rapidly of late. If we cannot render the objective diagnosis of blindness reliable, within practical limits, such legislation, custom or sentiment as has shown this development merely places the honest, industrious. kindly part of the community at the mercy of the morbid whims, cupidity, falsehood and selfishness of those whose extinction would benefit the race. Progress in the direction of benevolence, charity, public security or justice with regard to blindness rests today on its objective diagnosis.

Sources of Evidence.—The history of the individual case, even the history of subjective phenomena, may have all the significance and value of objective evidence. Thus, a history of recent sudden blindness, perhaps following accident, when examination shows old scars of the cornea or choroid, or vitreous opacity, either congenital or manifestly of long standing, is absolute evidence of falsehood, either intentional or from ignorance, that properly discredits all evidence from such a source. On the other hand, the history of sudden blindness in homonymous lateral half fields, supported by corroborative limitations of the fields, and other evidences of intracranial lesions, becomes highly valuable and significant. Every cause of blindness that we know links up with an appropriate and suggestive case history. Allowing for the fact that no

two cases are exactly alike in all particulars, it is next to impossible for any patient or claimant to construct a false history of his troubles that will pass critical consideration from an expert, unless he has the assistance of expert knowledge and experience that rarely lends itself to the purposes of the criminal. The case history carefully taken and considered, repeated if necessary and made the basis of cross examination, will, in the great majority of cases, reveal how much or how little credence can be given to the statement of the patient or claimant, and suggest in what directions objective examinations should be pushed to discover the truth.

The external examination of the eye in all cases of alleged blindness, complete or partial, should be carefully planned, prolonged and thorough. Every objective sign of previous disease should be noted and carefully considered with reference to its developmental or pathologic possibilities, the suggestions it makes of other lines of investigation, and the necessary or possible influence it may exert on visual acuity. A scar not perceptible to casual inspection may greatly impair visual acuity by the astigmatism, regular or irregular, that it causes. Only by eliminating or properly estimating all other factors causing impairment of vision can the right understanding of visual impairment by any one condition be determined. The objective diagnosis of blindness is the summing up of all ophthalmic diagnosis, in which common and generally unimportant conditions cannot be neglected without introducing sources of serious error and uncertainty.

The ophthalmoscopic examination of the eye contributes equally to our knowledge of pathologic conditions present, and in addition it furnishes a test of the influence such conditions exert to impair sight in the particular eye under examination, by impairing the transmission of light through the refractive media and surfaces of the eye. The light coming out of the eye

from behind the retina must pass through exactly the same physical conditions, to reach the eye of the observer, as light encounters after entering the eye from the external world, before it reaches the percipient elements of the retina of the patient. By familiarity with the details of the ocular fundus and the fundus reflex when fundus details are not visible, we secure at the back of the eye a series of test objects, the visibility of which can be compared with the visibility of the test letters and figures we use in everyday tests for visual acuity. By comparing visual acuity, tested in the ordinary way, in patients giving full cooperation in such tests, with the ophthalmoscopic visibility of the fundus, we can construct an approximate scale of fundus visibility that will correspond roughly to the visual acuity scale that we work with in general ocular examinations. This scale can be applied largely without the patient's cooperation, being in effect an objective method of examination.

In ophthalmoscopic estimation of visual impairment, skiascopy, from near the point of reversal, gives important evidence as to complete transparence of the ocular media and the share that ametropia, especially irregular astigmia, may have in producing visual impairment. Two eyes may appear to present about the same amount of opacity in the dioptric media; but in one skiascopy will be found impossible and in the other easy. It is safe to infer from the test that in the first visual acuity is greatly affected by the opacity, and that in the other it is not.

Each of us has developed some such scale for judging the effect of lesions impairing the transmission of light through the dioptric media, on which he bases his judgment as to the amount of visual impairment to be expected by a certain haziness of the fundus details. The noting as exactly as possible such interference with seeing the disk, central vessels, primary and secondary branches and smaller arterial and venous twigs,

pigment stippling, reflexes, and so forth, and comparing such notes with those of visual acuity in cooperating patients, will give each observer a better grasp of ophthalmoscopic diagnosis and will indicate just what details should be looked for and what significance can be attached to their observed visibility.

The method pursued for estimating the effects of opacity and irregular refraction in the refracting media may be modified for application to all observed deviations of the ocular tissues from their normals. We can record the inflammatory and degenerative changes in the retina, choroid and optic disk with the visual impairment associated in each case in which the patient cooperates in giving his exact vision; and from such records we might construct a practical scale of probable impairments of vision, for the different visible ophthalmoscopic changes that may be observed.

Along these lines we must seek answers to such questions as: What visual disturbance can be expected with simple detachment of the retina? What from a well marked glaucoma cup? How much importance can be attached to whiteness of the optic disk, as evidence of visual impairment by optic atrophy? To what extent do pigment migrations imply destruction of visual function?

When it comes to assessing the visual damage due to fundus lesions, a damage arising from structural and functional impairment of the tissues inspected, we are on more uncertain ground. But when these furnish the best evidence obtainable, apart from the claimant's statements of what he sees, every effort should be made to ascertain the probable significance of what we can see.

Certain definite and measurable lesions, such as detachment of the retina, have a positive, although not entirely exact influence, on visual acuity.

Exact observations as to color are of great importance for the estimation of visual capacity in the

retina and optic nerve. The cases of optic atrophy are interesting as regards color significance. In this connection, careful observation of the finer or nutrient vessels is of paramount importance, as in the deductions to be made from swelling of the optic nerve head. This is possible to us as regards the optic nerve, with carefully chosen light for ophthalmoscopy, and is probably equally available for the retina, when red-free light is systematically applied for that purpose. But it must be borne in mind that the exact color of the light used has enormous importance as influencing the appearances to be observed in all such examinations. The colors employed must be standardized before the significance of what is noted can be properly estimated.

The application of observations made with the corneal microscope promises a great deal of help in the diagnosis of blindness in the future. But a great many more of these observations must be made and carefully compared with corrected visual acuity before due importance can be attached to such findings.

The testing of pupil reflexes and ocular movements to avoid diplopia may give extremely important evidence as to blindness that may be present. It is fairly established that the direct pupil reflex to light implies a reflex arc, stretching from the retina to the primary visual centers along the afferent tracts, sufficiently effective to perform its function in a way that disproves complete blindness. Even a moderate direct pupil reflex is evidence of some vision, unless the visual tracts are interrupted beyond the primary centers by lesions affecting the optic radiations or visual cortex.

The evidence obtained by the direct light reflex is confirmed by the consensual light reflex in all cases of claimed monocular blindness. If the afferent tract is interrupted in front of the primary visual centers, the consensual light reflex is also lost for light thrown on the blind eye. But for loss of function behind the primary centers, we have homonymous hemianopia and

the hemianopic pupil inaction: so that the hemianopic pupil reaction has great practical importance in the diagnosis of blindness, as well as in the localization of lesions affecting the visual tract.

The attempts made by Hess and others to study the hemianopic pupil reaction by light impressions sharply localized on small parts of the retina within the so-called pupillomotor area have led to confusion and doubt as to the diagnostic value of this reaction. The method described by Fisher, if carefully followed, seems, however, to give definite and positive clinical data. If, with positive direct or consensual clinical reaction of the pupil to light, such reaction is found to be about the same whether the light falls chiefly on the right or on the left half of the retina, we are justified in concluding that the visual pathways are not interrupted behind the primary centers—that the person giving such reactions has light perception, and that if the reactions are good he has good light perception.

The consensual reaction is of especial importance when disease in one eye has bound down the pupil and it is asserted, has also caused blindness in that eye, the iris of the other remaining free to react under the influence of light. It is in connection with the pupil reactions that the claimant's statements with regard to the circumstances and nature of the disability claimed become of great importance.

Ocular Movements to Avoid Diplopia.—If vision is good in both eyes, and the faculty of binocular fusion is well developed, certain movements of the eye to avoid diplopia when a prism is placed before it, or withdrawn, are quite involuntary, and their absence may be taken as good evidence that binocular vision is not present. On the other hand, when these movements are elicited by placing a prism before one eye and removing it, we have proof positive that binocular vision is present.

Of course, a patient may have good vision in each

eye and yet have no power of binocular vision or to perceive binocular diplopia, and such a person will give no ocular movements in response to such use of prisms; but instances of such lack of binocular vision and diplopia are relatively rare, and detract little from the value of this test in the diagnosis of blindness. If the antidiplopic movements of the eye are elicited by this use of prisms, especially on repeated trials, it is proof positive that blindness of either eye is not present.

It is quite possible by careful selection of test objects to be presented to the eyes, and the background against which they are to be seen, to form with this test an approximate estimate of the degre of visual acuity present. But methods of making this a quantitative visual test should be worked out by careful experiment.

In Fuchs' work on the causes and prevention of blindness, congenital amblyopia, given as the cause of 0.2 per cent. of the cases in the statistics of Magnus, is the only cause that did not present characteristic objective evidence on which a diagnosis could be based. In this one condition the diagnosis must be reached through the history, and the absence of objective symptoms. The tests for malingering may be used to prove that the amblyopia is genuine and not merely psychic. But such tests must be multiplied and applied with great care, to furnish a sufficient basis for the diagnosis.

Half of Blindness is Preventable. "Half of all blindness is preventable," declared Park Lewis,[6] Vice-President of the National Committee for the Prevention of Blindness. "This is so," Dr. Lewis said, "despite the important reductions in both the frequency and severity of some of the principal causes of blindness resulting from the organized and nation-wide campaign for the prevention of blindness which is now in its

(6) Med. Times, August, 1926.

eleventh year. The total amount of blindness and half sight, however, is growing proportionately less."

Speaking on the economic necessity for conservation of vision, Lewis pointed out that the cost of educating a blind child is at least ten times that of educating a normal sighted child. As further evidence of the heavy cost to industry resulting from accident and diseases affecting the eyes, he declared that in New York State alone close to one million dollars are paid as compensation for eye injuries in a year and that almost an equal amount is paid by the employers of Pennsylvania each year.

"In considering the economic phase of the subject," the author said, "we are not thinking of the frightful loss to the man in the moral suffering which he incurs, in the dependency which necessarily follows from the loss of his own self efficiency, neither are we considering that long line of related losses which enter into the question, such as his inability to provide for his boy who would otherwise have gone to college, the young daughter who is sent out to work when she ought to be in school, the invalid wife who is deprived of the necessities that she ought to have and other relative conditions which you can easily imagine.

"There is not a loss suffered by any individual member of a community that is not in some degree shared by every other member. In industry today, it is a matter only of forethought and business acumen to so plan each factory and workshop that the greatest returns are produced with a minimum of loss, that the most serious loss that can be sustained is the irreparable injury of the most valuable implement in the shop, the workman, that the average workman is apt to be careless of his own interests and he needs to be guided in preserving them, that the loss when sustained is a triple one, first and most serious to the man himself who is thereby handicapped for the remainder of his life, and who if he works must thereafter work at re-

duced pay; second, to the employer who has to pay the price either through insurance or otherwise or he may lose the services of a valued and skilled workman, and third, to the commonwealth.

"Helen Keller, that prodigy of our age with a keenness of intelligence and clearness of perception possessed by few of us who have all of our physical senses, said some years ago, that the time would come when we would no longer point with pride to magnificent hospital and asylums and poor houses, but would bow our heads with humiliation and shame to realize that that we had been to such an extent derelict in meeting the obligations which we owe to our fellow men, as to permit the existence of the conditions which make such places necessary."

Ocular Therapeutics

The Therapeutic Action of Ultraviolet Light Upon the Eye. Of late years the treatment of general disease by ultraviolet light is being rapidly put on a scientific basis, but hitherto no serious attempt has been made to investigate how far it might be utilized in the treatment of diseases of the eye.

W. S. Duke Elder[7] presents a preliminary report of the experience gained at the Ultraviolet Clinic of the Royal London Ophthalmic Hospital, based on the treatment of seventy cases. The method of treatment cannot as yet be said to be altogether out of the experimental stage, and sufficient experience has not yet been obtained to dogmatize absolutely on its indications and limitations to assign to it its ultimate value in our therapeutic armamentarium.

As in the other parts of the body, so in the eye, the diseases most amenable to treatment are the chronic inflammatory. This, in fact, is one of the most satisfac-

(7) Brit. M. J., May 29, 1926.

tory aspects of phototherapy in ophthalmology, for in many of these cases little can be done by the ordinary methods of treatment at our disposal. The experience gained points to the view that in the earlier acute stages general phototherapy very frequently does more harm than good, and that relapses are prone to occur. The best time to commence treatment appears to be immediately after the acute symptoms have passed off, before the disease can be definitely labelled "chronic," and before the lesion is complicated by the accumulation of massive organized deposits, or restoration rendered impossible by extensive tissue degeneration and destruction.

The affection which gives the readiest response is ocular tuberculosis in any of its forms. The importance of this is realized when it is remembered that tubercle of the eye is one of the most depressing and hopeless diseases in ophthalmology. With the methods of treatment ordinarily used the history of such a case is too often one of gradual and relentless deterioration, ending ultimately in blindness or in the excision of the eye for pain. The effect of light treatment at the clinic has been most encouraging, and the patients have uniformly improved from its commencement—as a general rule slowly, sometimes with remarkable rapidity. No case would seem to be too bad to be altogether despaired of, and it would seem not unreasonable to hope that the prognosis of this disease may be completely altered.

The other disease in which startlingly good results have been obtained is phlyctenular ophthalmia, especially the type which is met with in so chronic and recurrent a form in the debilitated and sun-starved children of large cities. The ready and rapid improvement in these cases is remarkable; after a few days' treatment most of the distressing symptoms have disappeared and the photophobia has gone; after a few weeks' treatment a child whose eyes have been in a

chronic state of intermittent irritation for years will clear up, and the general health will improve in a remarkable manner. Relapses, however, have occurred in a few cases, and the end-results have not been sufficiently long observed to allow one to dogmatize on the permanency of the improvement derived from one course of treatment: but the relapses are easily controlled by a repetition of another course of irradiation.

Cases of infective iridocyclitis show on the average a much less dramatic response to ultraviolet light treatment, and a response which varies very much from case to case.

The one case of sympathetic ophthalmitis which has been treated improved so rapidly that in three weeks the eye looked quiet and the infection and practically all the keratitis punctata had disappeared. Three cases of choroiditis have been treated. One, a case of many years' standing, showed no apparent change; the other two rapid and marked improvement.

It is to be remembered that in all these cases the usual routine treatment with atropin, and so forth, was persisted in throughout; tuberculin was given to some of the tuberculous cases, arsenic to the sympathetic, and in the infective iritis any focus which could be detected was dealt with, and its removal attempted in the usual manner.

Chronic blepharitis, squamous or ulcerative, has been found to respond extremely well to ultraviolet therapy, especially the type so commonly met with in debilitated children, which is characterized by continual relapses, and lack of response to the usual local medicaments. In young children the quartz director is used to the everted lid margin; in older people light is concentrated thereon by the quartz lens. In some cases complete healing results from one or two applications of ten minutes to a quarter of an hour; in all those treated cure was eventually obtained. In the more chronic

cases, after some months, lashes which have fallen out regrow.

In the treatment of diseases of the conjunctiva the reaction aimed at is one of tissue irritation and destruction, and coincidently of bacterial destruction. Initial doses of five minutes are given, and the patient is seen the next day and the effect observed. If the reaction is good its subsidence is awaited; if not a dose of ten, fifteen, twenty, or even thirty minutes, is given, depending on the lesion. In doses of five minutes' duration an acute conjunctivitis starts in about eight hours, and lasts for forty-eight hours; after high doses of thirty minutes the latent period is shorter, and the inflammatory symptoms may remain for a week. A whitish-yellow false membrane forms which, if an attempt is made to remove it, reforms during the first few days, but which ultimately falls off, leaving fresh unscarred conjunctiva exposed. The absence of corneal damage does away with the distressing symptoms of photophthalmia, and the patient is little incommoded.

Two cases of chronic catarrhal conjunctivitis cleared up after six and eight sittings.

Three cases of trachoma gave quite satisfactory results.

One case of vernal catarrh showed slow but very satisfactory progress.

Corneal ulcers, especially marginal ulcers, have been found to respond very favorably to radiation. Two cases of hypopion ulcer became quiet after the third sitting.

Corneal opacities have been reported as partially clearing up with ultraviolet radiation.

Phlyctenular keratitis, in addition to being treated with general baths, is much benefited by the local application of light. One striking feature is the almost immediate, although temporary, relief which radiation with the filtered rays brings on in the photophobia and blepharospasm.

Interstitial keratitis, to judge from the ten cases treated, is little influenced either by general or by local treatment, although the photophobia is relieved, and the general condition much improved.

Acne, on the other hand, responds very favorably to the treatment. In the two cases treated, the distressing and damaging lesions on the cornea were greatly benefited, and recurrences have been so far warded off. Short exposures with the quartz director, or longer exposures to filtered rays, together with skin baths directed especially to the associated lesions on the face. have been found to clear up both the eye and the facial condition. Where, however, dense corneal opacity and infiltration have been caused by repeated attacks, these residua have remained while the active process has died down.

One case of *episcleritis* of unknown etiology completely resolved after three radiations of five minutes' duration of unfiltered light concentrated by a quartz lens.

A number of writers on the continent have reported very favorably upon the treatment of *iritis* and chronic *iridocyclitis* by local radiation alone; Koeppe, using filtered and concentrated long ultraviolet rays, is particularly enthusiastic over this method of treating tuberculous lesions, and with its use he has obtained very satisfactory results. In three cases of iritis which were being treated by general phototherapy, periods of a fortnight were selected, when, in addition to the general treatment, filtered rays were focused upon the iris for periods of ten minutes three times a week. In each case the patients asserted that considerably more improvement followed than by raying the skin alone, and the appearance of the eyes certainly did not belie their statements.

Choroiditis and *chorio-retinitis* have been similarly treated locally by Koeppe, Poyales, Birch-Hirschfeld, and Stock, and they report good results. It would

seem, however, that caution is to be observed in such treatment; general light baths do such patients good, as it seems that to focus light of an abiotic nature into the eye in such intensity that it will have any marked action is running an unjustified risk of laying down future trouble in the lens.

Up to the present the procedure adopted has been to accept for treatment any case that promises to do well at all, and all cases wherein the usual methods of therapy have failed. Such a method of selection obviously involves a proportion of disappointing results, since advanced and almost hopeless cases predominate; but the failures are no less valuable than the successes. Later, when methods of technic have been standardized, and results of greater statistical value have been collected and are compared with those of others, it would seem reasonably safe to predict that an agent of considerable value will have been added to our therapeutic armamentarium—an agent which, although not by any means a general panacea, is the more valuable in that many of its successes are those very chronic and difficult cases in which the prognosis has hitherto been so hopeless.

The technic employed is as follows. The mercury vapor lamp is used in preference to any form of carbon or metallic arc, owing to the smaller emission of heat rays. In diseases of the lids and conjunctiva, where an irritant abiotic effect is desired, a screening apparatus bearing a quartz director 8 inches long and curved half an inch from the tip at an angle of 140 degrees, concentrates all the emittent rays from the mercury vapor lamp into a parallel beam issuing from the director tip. The director is carried by a flexible spring holder, so that there is considerable play at its distal end, with which the cocainized and everted lids are slowly massaged, sufficient pressure being applied at the same time to render the parts temporarily anemic. It has a rounded end, so that it can be inserted into the re-

cesses of the fornices. In conditions such as trachoma, where a stronger effect is desired, the lids are everted and held so as to cover up the cornea completely, and the direct light of the lamp concentrated on the conjunctiva at a focus by a lens system of quartz. In the treatment of corneal lesions, where a similar irritant action is required, the director is held obliquely almost touching the cornea, its bent tip being at such an angle that none of the rays reach the pupillary aperture. Where an irritant effect is not required, but a mild abiotic and sedative action, filtered light is obtained by passing it through a Chance's filter and concentrating it to a focus with an ordinary glass lens, rays above 5,000 A. U. and below 3,000 being thus excluded.

It has been shown that the dose of light necessary to produce pathological effects visible miscroscopically on the cornea is slightly less than that required to produce a minimal erythema on the skin. The latter standard is therefore first obtained, and the local dose thus gaged. In conditions where the urgency of the case forbids waiting for the twenty-four hours necessary to obtain this standard (as in corneal ulcers) the average dose of two and a half minutes at the working distance (½ meter) is given, and the individual dose calculated in the usual way in the meantime. Local treatment is usually accompanied by a course of general light baths should the condition at all seem to require it, these reinforcing its action and giving the patient the benefit of the general tonic effect.

The Uviol Light. This apparatus, described by S. R. Gifford,[8] is designed for the administration of ultraviolet rays in concentrated doses, in such a way that they may be focused sharply on small lesions in the eye, especially on corneal ulcers. The source of light is a microarc lamp such as is supplied by the Zeiss Company for examination of the fundus with red free light. It is mounted on an adjustable stand. It is supplied

(8) Am. J. Ophth., September, 1926.

with a rheostat for use with the ordinary alternating current. In front of the tube is the uviol filter, ("a" in the illustration). The "uviol" glass of which it is made allows light of short wave length (ultraviolet) which is absorbed by the cornea, to pass; the visible rays, except a narrow band in the blue violet. It is supplied with the special irradiation arc light of Zeiss, which Birch-Hirschfeld has used, which is harmless to the deeper structures, being retained. A quartz cell containing iron sulphate solution may be placed before the filter to absorb the heat waves. Mounted on an arm in front of the filter is a quartz lens of 2.8 inches focal distance (b). By its means the ultraviolet rays passing through the filter may be focused to a small point on the cornea. A quartz lens is necessary since these rays would be absorbed by ordinary glass. The apparatus may be used for examination of the fundus by red free light, by simply changing the uviol filter for a red free filter and removing the quartz lens. (Fig. 18.)

Scheerer, Birch-Hirschfeld and others have reported very favorable results in various types of corneal ulcer, especially serpent ulcer, in tubercular keratitis, tubercular iritis and other diseases. They have recommended the instillation of fluorescein previous to the treatment. The light is supposed to act directly on the organisms and indirectly by means of the tissue reaction aroused. This action is thought to be increased by a chemical photosensitization of the tissues effected by the fluorescein.

The type of corneal ulcers which respond most favorably have been shallow recurrent ulcerations which have been very refractory in their disposition to heal under the ordinary methods of treatment. A number of these have probably been of herpetic nature. Here the action of the light combined with the ordinary methods of treatment has seemed definitely to hasten recovery.

A marked effect is also noted upon the pain from

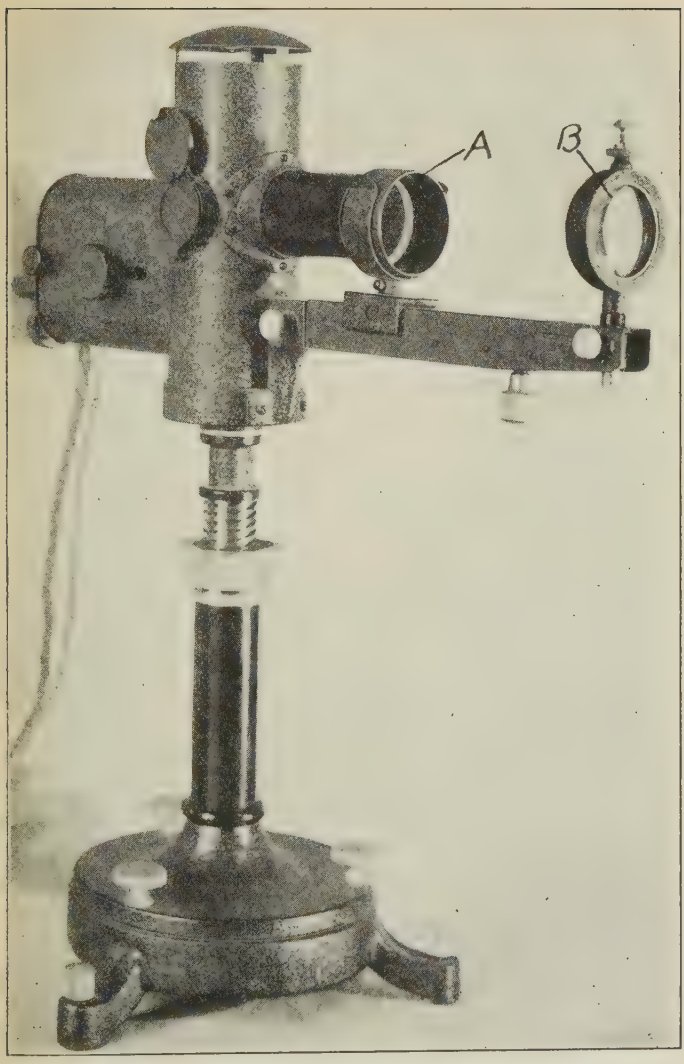


Fig. 18.—Apparatus for uviol light, Zeiss microarc lamp. *A*, Cell for uviol filter; *B*, Quartz lens for condensing ultraviolet rays.

such lesions, usually after the first application. Another condition which has apparently been affected favorably is sclerosing keratitis and other keratitides supposedly due to tuberculosis. The effect of the light combined with the use of tuberculin has seemed of very decided value in several of these cases. Applications are made every day or even twice a day for eight to twelve days, depending on the progress of the case. The light is focused as sharply as possible on the lesion for three to five minutes. One or two adjustments of the arc lamp is usually sufficient to last this length of time.

Besides its therapeutic use, the uviol light seems to present certain advantages from a diagnostic standpoint. Under its illumination the tissues of the eye and especially the lens are seen to be fluorescent. Very small lesions of the cornea, imperceptible by ordinary methods of illumination share in this fluorescence and are made easily visible. Such lesions as dendritic ulcers may be followed to their very fine ramifications under this light and some small infiltrations or erosions may be seen by it which otherwise might be missed entirely.

Radium in Ocular Therapy. DeGentile[9] gives the indications for radium treatment of various diseases of the eye; injuries to the organ can be avoided by proper precautions; in the usual method of application slight inflammation of the skin or conjunctiva may occasionally occur, but damage to the retina or optic nerve never. Radium is to be recommended in cicatricial keloid of the lids, as in lupus of the skin and conjunctiva; healing takes place without much shrinking. The same treatment is superior to all other methods in vernal conjunctivitis. In inflammatory disease of the cornea radiation does not exert the same favorable influence in all forms; it is particularly inferior to the usual methods in acute inflammatory affections; it is

(9) Clin. Ophth., 1925, 14, 18.

the method of choice in angioma of the lids. Lymphoma of the lids does equally well under radium as under the roentgen rays. Carcinoma of the lids, which has not yet extended to the tarsus or adjacent bones is completely cured by radium without disfiguring cicatrices. In glioma of the retina the results of radium treatment are bad. In malignant disease of the orbit, radium treatment following surgical operations may prevent relapses. Radiation of the hypophysis gives similar results to that of the roentgen rays. The symptoms of exophthalmic goiter, including the exophthalmos, are favorably influenced by radiation of the thyroid.

The Result of Treatment by Artificial Light on Phlyctenular and Other Tuberculous Lesions of the Eye. A. B. Nutt[1] selected a series of cases of phlyctenular disease of the eyes and in addition to use of tuberculin, cod liver oil emulsion with hypophosphites and local treatment, subjected them to irradiation from a mercury vapor arc. The patients strip and are exposed to the rays back and front; there is a nurse in charge who times the exposures, which commencing with ten minutes a day for the first few days, are gradually increased to one hour per day. The eyes are protected by wearing London smoked glasses. The cases treated fall under two headings: (1) the chronic cases that had been under treatment for a long period previously, with little if any improvement; (2) the recent cases treated as soon as they appeared in the outpatient department. The first group comprises cases with histories extending from five months to four years before treatment with the ultraviolet rays was commenced. There was exhibited in this first group a case of sclerosing keratitis; 1 of pannus; 2 of persistent marginal ulceration; and a strumous keratitis. Very good results were obtained in from four to fifteen week in all cases. The second group of recent cases responded equally

(1) Brit. J. Ophth., March, 1926.

well but are still under observation. Many of the cases give a violent reaction to tuberculin.

Intravenous Iodin Injections in Ophthalmology. This method of medication is warmly recommended by Metzger and Schnaudigel.[2] Their experiences extend to over 300 intravenous injections of which about half concern outpatients. A 10 per cent. sodium iodid solution, of which 5 c.c. are given for the first dose, followed by injections of 10 c.c. at intervals of from 2 to 3 days, has proved the most suitable. With acute inflammatory processes, daily injection may possibly be recommended. For children from 6 to 10 years, half the dose. The technic of the intravenous injection is the usual one, it is, however, unnecessary to draw the piston back after having inserted the needle, as the blood enters the clear contents of the syringe spontaneously as soon as the vein is opened in consequence of the higher concentration of the sodium iodid solution. The certainty of the technic is thus considerably increased The injection should be made slowly, about 1 c.c. per second. Paravenous injection should, of course, be avoided, small infiltrations, however, quickly disappear with the application of a moist bandage. Contraindications: high fever, thyrotoxic disturbances, decompensated cardiac defects, renal disturbances, simultaneous mercurial treatment. Idiosyncrasy to other iodin preparations is no contraindication; such patients usually tolerate the intravenous incorporation of iodin well; the only precaution taken in such cases will be to begin with small doses. Iodism does not occur even if the treatment is continued for a long time.

Indications.—The injections have a favorable effect on the resorption of blood and exudates in the vitreous humour and fundus oculi. Where arteriosclerotic processes are present, the effect of iodin on the circulation is an additional advantage. With congenital syphilitic affections of the eyes, intravenous iodin

(2) Indian Med. Rec., June, 1926.

treatment has an unmistakable specific effect. Parenchymotous keratitis which, as regards its local development only reacts slightly to mercury and hardly at all to salvarsan, responds extremely well to intravenous iodin treatment, in that the inflammation abates rapidly and the corneal clouding clears up quickly. Simultaneous local application of yellow eye ointment (unguent, hydrarg. oxyd. flavi, via humida parat. 1 per cent) causes no symptoms of irritation. This iodin treatment can be combined wtih bismuth injections, without causing disturbances. Specific paralysis of the muscles of the eye shows strikingly rapid improvement with iodin treatment. Tuberculosis of the iris and choroid responds well to intravenous injections of iodin, especially in combination with tuberculin treatment or protein therapy. Sodium iodin therapy, which seems promising by way of symptomatic treatment, further comes into consideration in inflammatory processes of the central nervous system with participation of the eye without definite etiology, such as neuritis optica, meningitis serosa, etc. With lead poisoning, the intravenous injection of iodin makes it possible to deprive the lead of its poisonous effect in an intensive and rapid way.

The White Blood Cells in the Treatment of Infections of the Eye. In the treatment of the severer forms of ocular inflammation, a rapid subjugation of the condition is essential, if the vision is to be preserved without much loss.

For about two years Arthur Zorab[3] has abandoned almost entirely medication by the mouth in favor of intramuscular injections. It does not seem to matter, he says, what the infecting organism might be, improvement would take place because the injection induced a high leukocytosis. He has used the three following drugs: collosal manganese, mercury salicylate and novar-seno-benzol; counts showed that the latter

(3) Am. Med., March, 1926.

two drugs produced a higher leukocytosis than the manganese, but they all produce a marked leukocytosis.

The conditions treated were (1) severe ulcers, (2) keratitis, (3) scleritis, (4) retinitis, (5) iritis, (6) cyclitis, (7) choroiditis, (8) optic neuritis, not due to cerebral tumors or renal disease, (9) dacryocystitis, (10) styes, and (11) trachoma.

There have been some intractable cases of iridocyclitis in which the affected eye has lost its vision: there have been many cases of trachoma in which after a preliminary clearing up of the secondary inflammation, no real improvement took place, but in the very great majority of cases of all types, improvement has been rapid and cure early. In all cases such local treatment as is usual was employed but the intramuscular treatment has in his opinion been the main factor in hastening the curative process.

As he has treated over two hundred cases in this manner he feels convinced that the results are of sufficient evidence to place the value of the treatment on a firm basis.

Emergency Ophthalmology

The average man in general practice takes little interest in ophthalmology, preferring rather to refer these cases to the oculist. There are exceptions to this rule, however, especially among physicians in the smaller towns where it is sometimes difficult to secure the assistance of a competent oculist. Melville Black[4] has outlined a few simple formulae which may be of benefit under these circumstances.

Many physicians are afraid to use atropin because they remember the bogey-man, glaucoma. Atropin may be used safely and is indicated in all severe ocular traumatisms. We so often see cases where a few drops of atropin used early would have spelled success. The failure to use it at a time when it would have caused

(4) Colorado Med., June, 1926.

the pupil to dilate, resulted in permanent adhesions which later could not be broken away.

The differential diagnosis between acute iritis and acute glaucoma to many physicians is not clear. In iritis the iris is congested and thickened, there is more of it than there should be; the result being that it occupies a larger amount of space than normal and therefore the pupil is encroached upon, it is contracted; i. e., it is smaller than that of the other eye. The iris is lusterless and dull in comparison with its fellow. Glaucoma on the other hand produces a condition just the opposite. The increased tension, caused by an enlarged vitreous body, pushes the lens forward and mechanically spreads the pupil until it is larger than its fellow. The increased tension causes a corneal haze and close inspection should enable the observer to differentiate between a corneal haze and a lusterless iris or cloudy aqueous. The corneal haze of a glaucoma is like the blowing of one's breath on a cold piece of glass. The taking of finger tension by other than an expert is not to be depended upon. The differential diagnosis should be easy from the signs given.

There is one other symptom of importance and that is pain. The pain of glaucoma is many, many times greater than that of iritis. It is sometimes so great as to cause delirium and vomiting. The delirium and vomiting may switch the attention of the physician to other parts of the body and the real cause, the eyes, be ignored. It is therefore suggested as a routine measure that when the patient is delirious and vomiting, the eyes be examined. If one or both eyes are very red, pupils dilated and cornea steamy, you do not need to look any farther for a cause. It is acute glaucoma of a most malignant type. To know what to do and to do it at once may save the patient's sight. Delay of a few hours may mean blindness. It is a well-known fact that this type of glaucoma comes on in the middle of

the night and it might cause delay to get an oculist to come to your assistance.

There are two things which you can do in this emergency. One is to drop in the eye a 0.5 per cent. solution eserin every five minutes until given six times. Massage of the eye, or eyes, should be *continuous* during this half-hour period. The second thing is to give the patient a bottle of citrate of magnesia. When you get your oculist he may add hot applications to what you have done and return in the morning to find the patient vastly improved. His further conduct of the case will probably be operative in order to prevent another fulminating attack. If it had not been for your timely interference there would have been a blind patient to operate upon.

Heat and Cold.—There are two great indications for the use of hot and cold applications to the eyes. Cold in traumatisms and heat in deep idiopathic inflammations of the eyeball. The use of these two remedial measures is very simple. *Cold applications*: Place a block of ice in a basin. Tear up old muslin into three-inch squares, double twice to make a pledget one and one-half inches square and four-ply in thickness. If one eye only is to be treated, two pledgets will be enough; if both eyes, four will be needed. After the pledgets are cold and wet, the eye, or eyes, are covered and the changes made every half minute as long as they feel comfortable. *Heat*: A basin of water is provided and kept at a temperature as hot as the hand will bear. The best agent to convey this heat to the eye is a flannel cloth. It is better than cotton because it is lighter and not so soggy. Hot applications should not be continued beyond ten minutes at a time because it is harmful if kept up too long.

Ocular Injuries.—A large percentage of these cases you will see first. They want relief and it should be your aim to give it and at the same time neutralize the cauterizing agent so that it will do no further dam-

age. In the majority of instances the extent of the damage is almost instantaneous. The tears neutralize and wash out the offending agent. The exceptions are when the eyes are filled with lime, mortar or any pultaceous mass containing a cauterizing agent. The tears cannot wash away all of this material nor can they render it inert. It should be removed at once and the eye filled with a bland oil such as olive oil, castor oil, or petrolatum. Atropin should be instilled and the eye patched or bandaged. The further conduct of the case will be to prevent adhesions and pull the eye through with as little inflammatory reaction as possible.

An endeavor to neutralize an acid burn with alkalies and an alkaline burn with acids should not be undertaken. A bland oil serves a much more useful purpose. In the past there has been a tendency on the part of some physicians to prescribe cocain for the relief of pain as a part of the after treatment of such cases. After a few instillations it ceases to act as an anesthetic and only serves to increase the patient's discomfort. Because of epithelial desquamation from the cornea and conjunctiva, a pathway is opened for infection. Therefore its use as a remedy for pain is to be deeply deplored. Iced applications have the highest place as pain relievers in such cases.

Burns of the eye from hot metal, including curling iron burns of the cornea, are very common. The burn is almost always very superficial, the epithelium of the cornea alone being destroyed. It is painful and causes much anxiety on the part of the patient and the family. These burns are very simple and the epithelium rapidly reforms if the eye is kept closed. Iced applications will make the patient comfortable if applied for a few hours and then the eye should be bandaged until the corneal epithelium has been restored. This is evidenced by the burned area no longer taking a stain from fluorescein or methylene-blue. Burns from molten metal, especial-

ly solder, are common. Molten metal when dropped upon a wet surface explodes and flies in all directions. When it finds its way into an eye it sticks to the globe and cause a deep burn. The adhering metal must be removed and the eye then treated accordingly. It is a severe burn and upon healing leaves a scar. Atropin should be used to place the eye at rest and measures taken to keep down infection, otherwise an ulcer may form which may prove most distastrous.

Penetrating Wounds.—Penerating wounds may be made by all kinds of things. When produced by small flying particles, such as metal, or rock, the all important thing is not to suppose that the foreign body has glanced off and not gone into the eye. There is only one way of being sure and that is to have a radiograph taken. It is remarkable how frequently the oculist sees cases in which the physician has dismissed the case with the assurance that the foreign body did not lodge in the eyeball. Subsequent loss of vision causes such patients to see the oculist, who orders an *x*-ray, and a foreign body *is* found in the eye. It is hard to satisfy the patient that the physician who first saw him should not have ordered this done. The physician cannot exonerate himself if he "supposes" when he has the means at his command to replace supposition by positive knowledge. Penetrating wounds of the eye by knife blades, scissors, sharp sticks and other sharp instruments cause most distressing injuries. These occur most frequently in children. Such patients are frightened and intractable and usually have to be placed under a general anesthetic before any attempt can be made to repair the damage. Attempts at repair should not be made by anyone except a qualified expert, who has at his command the necessary delicate instruments as well as the skill to make the repairs. You naturally ask, "What can we do?" You can instill atropin and by so doing the pupil is dilated at a time when it is still dilatable; *i. e.*, before inflammatory

reaction makes it impossible. You can fill the eye with 1-3000 bichlorid ointment, put a gauze patch over it and strap it in place with adhesive plaster.

Every physician who is willing to do ocular emergency work should carry in his bag a 1 per cent. solution of atropin sulphate, a tube of 1-3000 bichlorid salve, with and without atropin, and a one-half ounce dropper of pilocarpin muriate. Ocular antiseptics, such as argyrol, neo-silvol and the like are not out of place, but are not of very much use in emergency work. A few gauze pads, three inches square, put up in glazed paper, will be found very useful. When the paper is removed the gauze is clean and is just the right size to cover the eye. It should be held in place by adhesive strips. A little clean cotton under the gauze will form a pad which will keep the eye closed and at rest

Foreign Bodies on the Cornea. Hot particles of emery, hot cinders and oxidizable particles of metal, burn the cornea at the point of contact. It is just as necessary to remove this burned area in which the foreign body is imbedded as it is to remove the foreign body itself. If this is not done the burned area must slough out and in so doing infection is likely to result and an ulcer form whose consequences may cause much loss of time to the patient as well as a corneal scar which will damage vision.

An eye with a foreign body burned into the cornea must be closed after its removal and kept closed until the part has healed. The only way to positively tell when the spot is healed is to stain it with fluorescein or methylene-blue. A 2 per cent. solution of methylene-blue in a dropper bottle will prove a convenient and useful part of a physician's office equipment, if he expects to remove foreign bodies from the cornea. If he expects to do this work he should provide himself with a good sharp, foreign body spud, as well as a binocular head magnifier. It is also necessary to have some kind

of a good light, but this involves still more office equipment.

New Instruments

Breath Screen for Slit-Lamp Work. The illustration is largely self-explanatory. The apparatus, devised by Cecil Stockard,[5] consists of three parts. First, a wooden

Fig. 19.—Breath screen (Stockard).

peg about 5 cm. long, to fit in the hole, a small knob on the end of the peg keeps the clip from slipping off;

(5) Am. J. Ophth., April, 1926.

second, a metal clip, easily fashioned from a wire "Gem" paper clip; and third, the screen itself. This is made of transparent celluloid, 1 mm. thick and 15 cm. square, with corners trimmed off as shown. As such a large piece is removed from each upper corner, plenty of room is left for the focusing lens to move close to the microscope and the loose attachment of the clip to the peg allows the whole screen to swing aside if necessary. (Fig. 19.)

A New Method (Suction) for the Removal of Foreign Bodies on the Cornea. In the removal of foreign bodies on the cornea, one is often confronted with the tediousness of the effort, and in addition, a most unsightly appearing corneal surface produced by the instruments employed in removal, especially if viewed with high magnification, or corneal miscroscope.

In order to eliminate the above objectionable features, Sidney Israel[6] has devised a small glass tube to be connected to any form of suction device, preferably the small water suction cylinder that attaches to any faucet, as it is the most inexpensive and efficient. With

Fig. 20.—Instrument for removing foreign bodies from the cornea by suction.

this suction tube the majority of all foreign bodies lying on the cornea can be removed, and the time required in removal is only a fraction of the time consumed in the usual way with a foreign body spud. There is no trauma or abrasion of the corneal epithelium and no disability as a result. (Fig. 20.)

Practically all character and kinds of foreign bodies have been removed with this method. Of course, one cannot remove stains. In foreign bodies deeply im-

(6) Am. J. Ophth., April, 1926.

bedded, the suction method will facilitate ready removal by loosening, or making the foreign body easier to extract.

The technic is the same as in the removal of any foreign body located on the cornea. Local anesthesia (Holocain 2 per cent): the water faucet is turned full force in order to deliver the maximum amount of suction, and the glass suction tip, after having been sterilized, is connected to the rubber tubing of the suction apparatus. The fine smooth point of the glass tip is then brought into absolute contact with the foreign body, and removal takes place immediately. There can be no injury to the corneal surface as the method is free from any risk or mishap. The amount of suction is easily controlled by pinching the rubber tube, or with the finger over the hole in the glass tip made for the purpose.

Forceps for Positive Fixation of the Globe. No doubt others have experienced some difficulty with fixation when operating at the limbus, either laterally or above, for paracentesis, anterior sclerotomy, angular keratotomy, and so forth.

If the fixation is at the opposite side of the cornea there is a tendency to rotation and the fixation point must be as carefully anesthetized as the point of incision. If the fixation is on the same side as the incision the ordinary forceps is in the way of the operator. With the forceps here illustrated, devised by J. M. Patton,[7] the operator is sure of positive fixation, whether operating laterally, above, or below. The line of force is away from the point of fixation, a pull rather than a push, as in the usual method. Only one area of anesthesia is necessary. The sliding catch which is adapted from the Gifford fixation forceps holds the points firmly together, or the forceps can be used without the catch if so desired. Finally, the large window leaves an unobstructed operating field which

(7) Am. J. Ophth., May, 1926.

is easily accessible and constantly under control. (Plates XV, XVI.)

A Device for Testing the Color Sense. A scheme that has all the advantages of the color skein system without most of the disadvantages, has been devised by W. G. Nelson.[8]

He has termed the test the "color wheel test," because of its construction. The device has compactness, being 15 inches square and about 2 inches at its highest point. It also has permanency, for it is constructed of strong, though thin, wood. Metal could be used as well.

On the base are arranged three wheels, one above the other, decreasing in size. On the base and on each wheel are arranged small rectangles of colors in both primary and intermediate shades.

The base and wheels are covered with white enamel, which permits of washing when soiled. The colors are also of washable paint and can be cleaned at will, with a damp cloth.

With this arrangement any given color can be matched simply by turning the wheels; when an applicant performs the task correctly, there will be four colored rectangles in a row, all of the same color, but possibly of lighter or darker shades. If the test is not performed correctly there will be a confusion of colors.

The person being tested can be required to enumerate each color in order, to name certain colors picked by the examiner, or to pick out all the shades of a given color. The color wheels can also be used to instruct applicants in colors, if they are merely color ignorant and not color blind.

It has been found from frequent examinations, in conjunction with the other tests, that color blindness can be successfully detected by this device. The applicant can see at a glance all the colors, and a great

(8) J. A. M. A., Oct. 17, 1925

amount of time thus can be saved. The device is compact, and the colors cannot be lost.

If desired, small colored silk or wool skeins can be substituted for the paint colors.

A Useful Eye Bandage. An eye bandage, which A. B. Reese[9] uses, possesses certain distinct advantages, as follows:

The proximal end of the bandage for about 6 inches is placed obliquely over the eye that is not to be bandaged (*A*); on the forehead over the eye to be bandaged, it is reversed (*B*), and a turn or so is taken around the forehead in a direction away from the

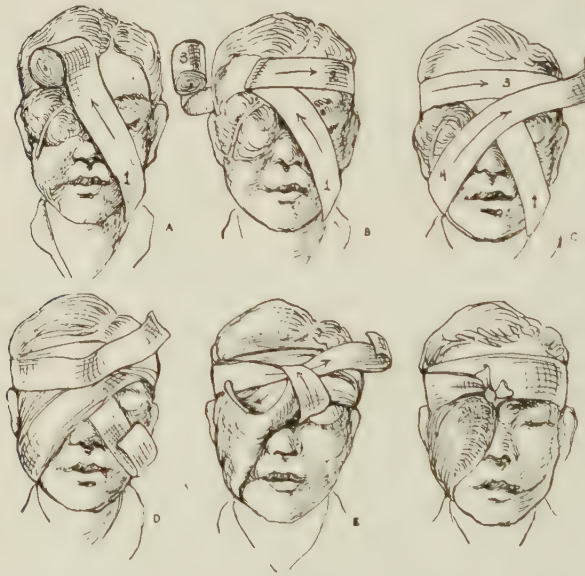


Figure 21.

bandaged eye. Then it is brought up under the ear and over the eye to be bandaged, the first turn being close to the nose (*C*). The bandage is then completed by making alternate turns around the forehead and over

(9) J. A. M. A., Oct. 24, 1925.

the bandaged eye (*D*). The last turn must be around the forehead (*D*) and the distal end is then tied to the proximal end (*E*) which frees the unbandaged eye (*F*). (Fig. 21.)

The advantages of the bandage are:

1. No adhesive plaster is necessary.
2. Pressure on the eye can be made to almost any degree, by varying the tightness with which the ends are tied.
3. The tying of the ends pulls the bandage in snugly and tightly along the nose (*F*) and makes it conform in a convex manner over the eye.

Full Vision Bifocal Operating Spectacles. Many forms of glasses have been devised to enable persons to see at a distance with one part of the lens and at a close range with the other part.

The bifocal is usually placed in the lower segment, although sometimes it is in the upper segment or in the center. These various arrangements of lenses afford either long or short distant vision through only a part of the lens, and it is impossible to view the whole field in all directions.

The spectacles recently devised by Myron Mentzenbaum,[1] consist of two pairs of lenses in two separately hinged frames. The first pair gives full vision for distance. When the second pair is lowered against the first pair, it supplies the additional lenses necessary for full near vision. For certain work, the full vision is desirable or even necessary. (Plate XVII.)

For the ear, nose and throat specialist whose offices are usually made up of several units and who goes back and forth from one patient to another, this type of spectacles is very practical. During an examination the additional frame is lowered, giving a full near vision, and it is raised when walking to the next patient.

In the operating room the spectacles are worn for

(1) J. A. M. A., Jan. 16, 1926.

distant vision, and the nurse lowers the additional frame when the operator wishes to begin.

Each frame holds a pair of single lenses, or one or both pairs may be made up of bifocals, so that various combinations can be obtained.

The spectacle frames are neither patented nor copyrighted, and at present are hand-made by the American Optical Company, Rose Building, Cleveland.

Reading and Writing for the Recumbent. Fatigue and eyestrain that result from writing by hand on a board held against the chest, or from reading from a book held in the hand, are not only harmful in themselves but may seriously impair the morale of patients

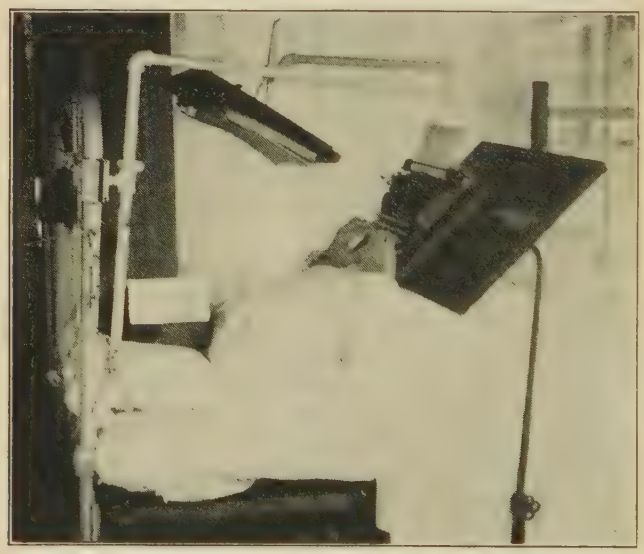
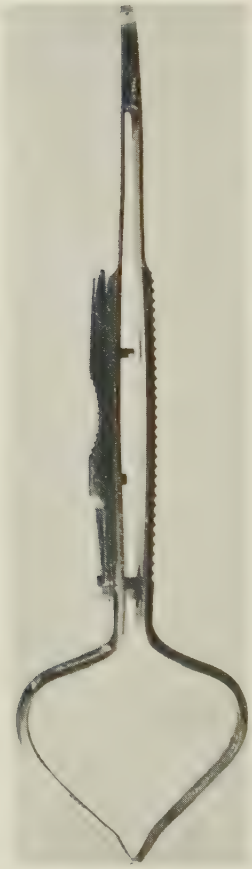


Figure 22.

with chronic disease who must lie flat in bed for a long time. Provision of facilities for reading and writing with ease may well dispel much of the dread with which most patients face prolonged confinement in

PLATE XV.

Method of using forceps. There should be firm fixation of the rectus tendon on the side of the eyeball on which the operation is done. —Patton, page 220.



Side view of forceps showing sliding catch. Patton, page 120.

Full vision bifocal operating spectacles, consisting of two pairs of lenses in two separately hinged frames.—Metzenbaum, page 223.

bed, and may furnish many possibilities for occupational therapy and contentment.

A convenient device is described by John Alexander.[2] Typewriting may be as easily performed in the recumbent position as when sitting. A bedside table that is adjustable as to height and tilt (such as may be had at hospital supply stores) is put across the patient so that its lower edge rests lightly on a small pillow or pad placed on the patient's upper abdomen or on a plaster body-cast as pictured. A portable typewriter (the new Corona or the Underwood lend themselves to this use, but not the Remington, Hammond or old Corona) is then put on the table and caught in the wire rack that is incorporated in the table's edge. With his elbows resting comfortably on the bed, the patient may reach the keyboard with his fingers. Without any especial adjustment of the machine, writing proceeds with the usual speed. Although the keys and writing points are perfectly visible, it is an obvious advantage for the patient to learn the touch system and so to eliminate the need for watching the machine. In fact, teaching oneself the touch system is one of the pleasantest forms of occupational therapy. (Fig. 22.)

The special bookrest shown in the illustration has been designed by Miss Dorothy Forbes of Boston and will firmly hold large or small books or magazines in almost any position. It may be raised or lowered after the loosening of a single wingbolt. The reading board is joined to the bracket by means of a ball and socket joint, which may easily be loosened or tightened by an accessible lever. This joint permits the book to be held in the proper reading position for a patient who is sitting upright or for one who is lying flat or in any intermediate position, or even on his side. The universal adjustability of the reading board makes it easy to keep the page at exactly the proper angle wtih the eyes and so to eliminate eyestrain. A simple arrangement

(2) J. A. M. A., Jan. 30, 1926.

for holding the book permits the leaves to be turned in an instant with one hand. The whole bookrest is attached to the bedpost by a felt-lined clamp and when not in use may be folded and swung to the side.

A Corneal Shield. Following division of the sensory root of the gasserian ganglion for the relief of trigeminal neuralgia, a subsequent anesthesia remains over the skin, the cornea and the conjunctiva supplied by the trigeminal nerve. This anesthesia is a sequela that the patient must accept in lieu of the excruciating pain that is associated with the disease. The anesthesia is not of any particular significance except in the

Fig. 23.—Eye cup of corneal shield, constructed of zylonite and may be molded or ground to fit any orbit; a metal band holds the lenses securely in place; the cup is 42 mm. in diameter, and will fit any standard 42 mm. frame.

cornea, where it allows the entrance of foreign bodies into the eye and the consequent abrasion of the cornea without the patient's knowledge. Injuries of this kind are extremely serious, since postoperative corneal ulcers heal slowly and often fail to respond to the usual treatment; they may result even in serious opacities of

the cornea and finally in loss of vision. Hence, it is highly imperative that the patient protect the cornea, on the side operated on. For this purpose a special corneal shield has been devised by A. W. Adson and A. A. Schroeder[3]. (Figs. 23, 24.)

Fig. 24.—*A*, lateral view of corneal shield and frame. Cup is fitted to a specially constructed frame. This type of frame is recommended, since it fits more satisfactorily than the saddle-bridge frame, and can be worn with greater comfort; *B*, corneal shield in place in frame adjusted to a patient who previously had an operation for trigeminal neuralgia.

The corneal shield possesses the merits of excellent protection to the cornea, and can be made to fit any substantial frame. It can be ground or molded to fit any orbit, and carries any lens that may be required for refractive errors. It is made of crystal and zylonite, is more or less inconspicuous, and is light enough to avoid pressure on the cheek. Therefore, it is ideal for patients who have been subjected to the

(3) J. A. M. A., June 12, 1926.

operation on the gasserian ganlion or division of a sensory root; it may also be used for glasses for persons who wish protection for the eye against the entrance of foreign bodies.

The Ear

ALBERT H. ANDREWS, M.D.

THE EAR

Hearing Tests

The Clinical Value and Diagnostic Significance of the Newer Tests for Hearing. According to E. P. Fowler[1]:

1. Many ears believed perfect by the patient show marked defects in the audiographs, especially in the frequencies not used for speech.

2. Many abnormal ears appear to be inherited and change not for years or life. Other members of the same family may have like abnormalities. Is this normal for this ear or this family?

3. The developed defects at certain frequencies, although unnoticed by the patient, may warn the examiner of impending deafness. Sufficient time has not yet elapsed for us to interpret these graphs diagnostically.

4. Returns to normal or near normal are shown with great precision.

5. Failure to return to normal is most importantly demonstrable, and treatment may be undertaken which otherwise would not have been deemed reasonable.

6. Malingering is easily detected, because no one can repeatedly sense correctly a given intensity of sound. (Wild variations point to faking.)

7. To diagnose total deafness in one ear, one may construct for a guide binaural graphs of known instances of monaural total deafness, and compare with such guiding graphs the curves obtained from suspected totally deaf ears. If they agree as to the differences in the losses as between the two ears in such patients, one may put it down as total deafness in the affected ear. (Of course such a guiding graph is ob-

(1) Laryngoscope, December, 1925.

tained by charting the hearing of the good ear from the sound applied to the opposite side of the head.

Many striking peculiarities and deductions are suggested from the graphs.

Clinical Observations on the Use of the Audiometer in Testing the Hearing. W. Nemzek and H. Hays[2] report a series of cases illustrating the value of the audiometer records. From their experience they believe the following:

1. The audiometer is an instrument which gives a rapid accurate method for testing the hearing.
2. It shows in what part of the hearing apparatus the pathological lesion is present.
3. It indicates when conductive and perceptive lesions are combined.
4. Its greatest value lies in its ability to definitely tell whether the individual under treatment is receiving any benefit from treatment.
5. It allows of comparisons of hearing tests by different individuals.

The Problem of Middle Ear Mechanics. Binaural Acuity for Air and Bone Transmitted Sound Under Varying Conditions in the External Auditory Canal. According to F. W. Kranz and W. C. Sabine[3], the determination of the method or route by which bone transmitted vibrations normally affect the end organ is of fundamental importance. The possibilities are not many: (1) The cochlea with its contained fluid may itself be jarred by the vibrations passing through the petrosum to affect the end organ direct (cranial transmission). (2) The vibrations through the bone may affect the stapes footplate through its peripheral ligamentous attachment to the otic capsule, or possibly the membrane of the round window, or both, and thus be transmitted to the fluid of the cochlea in the usual manner of air transmitted sounds. (3) The

(2) Laryngoscope, August, 1926.
(3) Ann. Otol Rhinol. & Laryng., December, 1925.

vibrations may be transmitted to the ossicular chain through the ligamentous attachments to the walls of the middle ear. (4) The transmission to the ossicles may be through the muscle attachments, the M. tensor tympani or the M. stapedius. (5) The vibrations may affect the drum membrane through its peripheral attachment and be transmitted to the internal ear by way of the ossicles. (6) The vibrations of the walls of the middle ear may give rise to aerial vibrations in the middle ear which affect the oval or round window or the drum membrane or a combination of these. (7) The vibrations of the walls of the external auditory canal may give rise to aerial vibrations which are transmitted by the way of the drum membrane as are the usual aerial sounds from an external source. These routes, or a combination of them, seem to cover the possibilities. Experimental methods of differentiating between them are being investigated.

One means of identifying the pathway of bone transmitted sounds is by artificially affecting the mechanism of hearing and determining the effect on both bone and air transmission. Perhaps the method by which we would proceed, if we had all the mechanism of hearing under experimental control, would be first to interfere with the action of the cochlea and determine the effect on bone transmission. If we found that we also interfered with the reception of air transmitted sound we would proceed outwards and restrain or affect in some way the round and the oval windows and note the effect on bone transmitted sounds. Determination also of the effect on air transmitted sounds for each changed condition would give a criterion of the effectiveness of our restraining or blocking of the auditory pathway.

Experimentally we cannot proceed in this manner; but we can start from the outer end of the auditory path, produce changes in the efficiency as determined by measurements of the effects on air transmitted sounds, and then determine whether or not we have pro-

duced a change in the efficacy of bone transmission. If a change is found in bone transmission we may conclude that the route of bone transmitted sounds into the internal ear is at least in part by way of the transmission apparatus affected by the change which was made.

Specifically, if the drum membrane is pushed inward by increasing the air pressure in the external auditory canal, the amount of change produced in the reception of air transmitted sounds can be measured, and this is a criterion of the disturbance of the mechanism. Now if we find we have produced a similar change in the acuity for bone transmitted sounds by applying this air pressure, it may be concluded that the route for bone transmission is, at least in part, by way of the drum membrane or of the ossicles, the ligaments or the muscles which are affected by pressing the drum membrane inward. If the change in the energy required for air transmission is of the same magnitude as the change in energy required for bone transmission, it may be concluded that the affected elements of the mechanism constitute the major part of the pathway for bone transmitted sounds into the internal ear.

Exactly this kind of an experiment can be and was performed by the authors. Interferences in the hearing mechanism were produced by both negative and positive pressures in the air of the external auditory canals. The effect on air transmitted sounds was measured by use of a thermophone sealed in the ear, in connection with the vacuum tube oscillator, the procedure having previously been described, and is similar to that for the bone transmission. The effect on bone transmission was also measured. Tests were made at seven levels of pressure, positive and negative pressures of 10, 20 and 30 cms. of water and neutral pressure, and five frequencies were employed, 128, 256, 512, 1024 and 2048 cycles per second.

Two persons were tested for air transmission to each

ear and for bone transmission from the forehead. In the bone transmission tests, the air pressure was applied to both ears at once. The air pressure was applied and also measured by means of a water manometer or U-tube. The bottom of the U-tube was connected to a source of variable water pressure, and one of the upper ends of the tube was connected with the ear, the other end remaining open. The tube leading to the ear contained a stopcock, which was closed after the proper pressure was applied and measured, so that the length of air column connected to the external auditory canal was constant and did not vary with the height of the water column in the manometer. The tube terminations were sealed into the external auditory canals with dental impression compound, and around the edges a layer of liquid glue was placed as an aid in making the cavity air tight. With sufficient care in packing in the wax, the tube could be sealed into the external canal securely enough to hold the maximum positive pressure used. The negative pressures offered no difficulties at all. For the air transmission tests the thermophone was sealed into the pressure tube just at the entrance to the ear.

The results of the authors' experiments show the following:

1. The observational error in making bone transmission tests is greater than that found for air acuity. The relatively wide variations in bone acuity are not necessarily dependent on similar variations in the air acuity.

2. Good bone acuity in normal individuals is somewhat more closely associated with good air acuity than with poor air acuity.

3. The advantage to bone sensitivity of occlusion of the external auditory canals seems to be a function of the frequency. The advantage is greatest in the lower frequencies and gradually drops off until at

2,600 cycles per second none of the four observers used was benefitted through occlusion.

4. Test on the effects of plus and minus pressures in the air of the external auditory canals on the acuity for air transmitted sound showed the greatest sensitivity when the pressure was atmospheric. Plus and minus pressures decrease the acuity.

5. Plus and minus pressures in the air of the external auditory canals showed that the greatest sensitivity for bone transmitted sounds was found when the pressure was atmospheric.

6. In the one case where the air acuity was greatest at about 10 cms. water pressure minus, the bone acuity was also greatest at this pressure..

7. The evidence submitted shows that the normal route to the layrinth, for both air and bone transmitted sounds, is through the stapedial footplate.

8. The normal labyrinth is wonderfully insulated against all vibrations passing through the otic capsule, and whether or not this insulation is lifted in cases of otosclerosis through the pathologic changes in the petrosum remains to be investigated.

The Gelle and the Lucæ tests are based on the fact that there is normally a decrease in air and bone acuity, respectively, under conditions of plus pressure in the air of the external auditory canal. The explanation for this decreased acuity is based on the assumption that the displacements of the drum membrane, due to plus pressure, increases the pressure within dial footplate. The authors' results, however, show that not only a plus pressure but also a negative pressure in the air of the external auditory canal decreases both bone and air acuity for normal hearing people. Either we must assume that negative pressures in the labyrinth produce similar effects to positive pressures or we must seek some factor outside of the assumed changes within the labyrinth to account for this phenomenon. Kato has shown that medial displace-

ment of the drum membrane does not produce an increase in the labyrinthine pressure so long as the intrinsic muscles are intact. It seems reasonable, therefore, that the factor affecting acuity under pressure lies outside the labyrinth and is the same sort of factor for both positive and negative pressures in the air of the external auditory canal.

[The fact that in making bone conduction tests—if the handle of the vibrating tuning fork is allowed to touch the auricle, bone conduction is apparently greatly increased—rather confirms the writer's opinion that in bone conduction the sound waves reach the internal ear through the stapedial footplate.—Ed.]

Fundamentals of Bone Conduction. Bone conduction in its relation to health and disease of the hearing apparatus is discussed by E. P. Fowler[4].

As generally conceived, an obstructive lesion is one in the external or middle ear, a nerve lesion one in the nerve paths or inner ear. It appears more rational to designate an obstructive lesion as any lesion preventing sound stimulation from reaching the hair cells in the normal manner or amount; and a nerve lesion (pure) as one which diminishes perception of a normal stimulus which has reached the hair cells. With this conception, then, we may designate obstructive lesions as purely mechanical, nerve lesions as purely neuropathic.

Mechanical obstruction to the transmission of sound vibrations may occur from closing the air passages, edema, new growth, fixation or altered tension in the middle ear structures; gummas and tubercles in the outer or inner ear (labyrinth), atresia or variations from normal of the helicotrema or any of the auditory perilymph or endolymph channels or abnormal fluids therein.

Neuropathic variations in perception may occur from stimulation or depression, regeneration or degeneration

(4) Arch. Otolaryng., December, 1925.

of the eighth nerve, centers, ganglions or hair cells. Hyperacuity by bone or air conduction is small (if it exists at all) compared by hypoacuity.

Diminished bone conduction in many cases is due to the masking effect of entotic and extotic noises, but in the notably deaf a loss in bone conduction indicates nerve deafness unless we can prove otherwise. On the other hand, there is no doubt that some obstructive lesions may diminish bone conduction at certain frequencies.

It is useful to make accurate measurements of bone conduction: (1) for the calibration of the ear of every examiner; (2) for the calibration of normal ears; (3) for comparison with air conduction (to make both with similar accuracy); (4) for keeping dependable histories so that the disease may be accurately diagnosed and followed; (5) for furnishing another curve with which to study the dynamics of the ear.

For a single primary diagnostic observation, extreme accuracy may not be so essential, but for the measurement of a change in bone conduction, great accuracy is of paramount importance. We do not know the original normal bone conduction of the ear examined, and if we fail to make an accurate primary test at subsequent examinations we shall not know what changes have occurred.

Causes of error in measuring bone conduction by tuning forks are:

1. Observational: (a) From the position of the source of sound with respect to the ear (hence the mastoid should always be used); (b) from the variations in strength of the sound (due to variable reaction of the ear); (c) errors in reading and recording instrument (stop watch); (d) attention (several tests will demonstrate if skew); (e) accommodation (of small importance alone); (f) mentality of the observer (if poor, tests will be inaccurate; misinterpretation of feeling tone for hearing, etc., hence explain); (g) variation of

technic of examiner (advisable always to use the same); (h) method of setting fork for minimum audibility (intermittent placements should be used); (i) interfering noise (examination should be made in quiet place or ears should be closed gently without hard pressure on Tragus).

2. Sampling: (a) Variations with individuals (up to 8 seconds [14 sensation units;] thickness of muscle and scalp; enlarged glands beneath fork, scar tissue); (b) variation with time (up to 7 seconds [12 sensation units]); (c) variation with experience (patients train quickly); (d) variation with frequency and amount of tinnitus which causes masking.

3. Scale of Intensity: (a) In seconds or sensation units (every fork differs in intensity [same fork to be used], frequency, and purity of tone from every other fork unless especially standardized and kept true: clamps or widened ends to prongs aid).

4. Abnormality: (a) Uncertainty of detecting defects (only a complete otologic examination can diminish this factor).

5. Age: Between 50 and 70, bone conduction begins measurably to diminish due to (a) changes in mineral content of bones, (b) diminution in blood supply, (c) relaxing of tissues, hence lessened elasticity, (d) nerve deafness.

Bone conduction in abnormal ears is subject to the same errors as in normal ears, but some are more difficult to eliminate because it may be impossible to place a fork on the spot regularly used on account of tenderness, ulceration and wounds. The abnormal ear varies more than the normal (it is this variation which we desire to record). Attention is distracted on account of pain, discomfort or worry. Accommodation is usually diminished. Mentality may be affected by the disease. Often the patient may feel and not hear the vibrations. In diseased ears purity of tone may be diminished by the lesions and also the frequency sensi-

tivity may vary differently from the normal ear. The greater the complexities of the defects the greater are the variations (crossed auditions are frequent and often are not detected).

The most dependable and time saving technic in the author's hands has been as follows:

The physician stands directly in front of the patient, who is seated with the head firmly supported by a head rest. The fork is held lightly in the right hand and the flat side of the extremity of one blade is struck forcible on a hocky puck, or just above the patella. For the high frequencies a piece of wood is used, or the prongs are snapped between the thumb and forefinger of the left hand, always employing the same force.

For bone conduction the shank is applied every three seconds slowly by firm deep pressure vertically against the mastoid three-fourths inch behind the ear, on a level with the superior mental wall, as there is usually a slight depression and less padding on the skull at this point than in any other as convenient a location.

As the fork is struck, a split second double hand stop watch held in the left hand is started. This sets both hands in motion. If the air conduction is also to be recorded, the fork is placed before the meatus with the extremity of the flat side of one prong parallel to the side of the head, and the meatal and mastoid placements are alternated every one and one-half seconds. If the fork is being applied to one ear for air conduction only, it may be alternated between the meatus and the scalp, or some convenient place of like damping effect.

The intermittent application enables us to avoid tiring the patient, increases accuracy by alternating sensation and lack of sensation after it has ceased. With bone conduction it also avoids the discomfort of constant pressure and one-half of the damping of the fork thereby. By deliberate and slow deep pressure,

the danger of reactivating the fork by the shock of application is avoided and also any danger of not using the exact amount of pressure best suited to transmit the sound. The lateral presenting edge of the fork should be made to coincide with this line. Distance is important because sound increases and diminishes greatly, depending on the distance from its source.

The patient should be instructed to say "yes" or "no" as to whether he hears or does not hear the sound of the fork at each placement on the mastoid and before the meatus. The instant the patient says "no," the alternate placements should be continued, but one hand of the watch should be stopped by pressing the side button, allowing the other hand to proceed, until another "no" signals the examiner to press the stem button. One then knows definitely the number of seconds the fork was heard by air conduction, by bone conduction or by both, as the case may be.

Conclusions: 1. Closing one or both ears increases duration of fork on mastoid from 14 to 16 sensation units, or from 8 to 9 seconds.

2. Closing the meatus gives the same increase with the fork on the vertex as with the fork on the mastoid.

3. The right and left ears give about the same increase on closing the meatus.

4. Between the vertex and the mastoid irrespective of the closure of the meatus, there is a difference of about 9 seconds (16 sensation units).

5. The meatal closure increases bone conduction about 9 seconds (16 sensation units), irrespective of where the fork is placed.

6. In this case the two ears may be considered equal.

7. No physical significance should be attached to the increase on closing the meatus is about the same as that in changing the fork from the vertex to the mastoid.

8. The increase obtained by closing the meatus is independent of the position of the forks.

9. Figured from the constants of the fork, and the difference in time, the fork gave roughly ten times the amplitude of motion to the ear mechanism when placed on the mastoid than when placed on the vertex.

10. Closing the meatus figured in the same way also gives an increase of ten times the amplitude of motion to the ear mechanism.

11. Several tests made by filling the meatus with 1 c.c. of water indicate that the ear mechanism will vibrate by bone conduction from ten to twenty times as violently with as without the water filling (that is, it is from ten to twenty times more intense.) It is conceivable that lesions producing similar mechanical effects might in the same manner increase bone conduction.

It is desirable to measure bone conduction accurately, rationally and in understandable units of measurements that can be correlated and charted with air conduction.

A simple rational method of measuring both air conduction and bone conduction in this manner is described. It is based on making the decrement in intensity of tuning fork tone the same for air as for bone conduction (in other words, the damping is made the same for both).

This is accomplished by continuing to alternate the placement of the fork between the mastoid and the meatus until the sound ceases to be heard by both. Advantages and variations of the method are noted. Tuning forks should be calibrated so that all tests may be in the same units of measure. A method for obtaining any desired accuracy by employing the law of probability with calculations illustrating normal cases, and some experiments show that:

1. An accuracy of less than a second's variation was obtained in the subjects tested (less than 2 sensation units).

2. Closing the meatus causes the same increase in bone conduction whether the fork is on the vertex or mastoid or on any other part of the skull.

3. This increase with a 256 double vibration fork was about 9 seconds (16 sensation units).

4. This increase is equivalent to an increase of ten times in amplitude.

5. A similar difference exists between vertex and mastoid placement of the fork.

6. Runge's water filling method causes an increase in amplitude of ten to twenty times the normal.

7. No lesions causing this amount of increase have been encountered.

[Reports given by writers regarding bone conduction in their cases are usually inaccurate and frequently misleading. In view of the sources of error enumerated above this should not be surprising. Uniformity of procedure is important, and the method proposed by this writer will eliminate several of the usual difficulties. It will be found however that if the 256 or 512 fork is pressed lightly against the mastoid either continuously or intermittently, until no longer heard, then a little deeper pressure be made, the patient will hear it again. The theory that increase in bone conduction in middle ear disease or by obstructing the auditory canal is due to elimination of extraneous sounds is untenable. If the test is conducted in a practically silent room bone conduction will be increased by closing the canal.—Ed.]

The Nasal (Sphenopalatine) Ganglion. In an attempt to explain the result on bone conduction tests when the auditory canal is filled with water, J. W. Downey* reports the result of his experiments. J. G. Runge was the first to suggest this method of examination.

The test is made, first, by taking the patient's bone conduction with the fork on the mastoid; the head is

(*) Arch. Otolaryng., September, 1925.

then placed over to one side, the ear filled with 1 c.c. of water and the bone conduction again taken. Runge found in the normal ear that "water-filling" about doubled the duration of perception by bone conduction up to C^2 fork (512 double vibrations); above this pitch the reaction was not so pronounced. He further found that in pathologic cases the results were entirely different.

1. After the radical mastoid operation, "water-filling" did not increase the bone conduction.

2. If there was evidence of complete fixation of the stapes, the test did not increase the bone conduction.

3. If there was only partial ankylosis somewhere in the ossicular chain, the "water-filling" gave only a moderate increase in the duration of bone conduction.

4. If there was evidence of cochlear degeneration, bone conduction which was greatly reduced could usually be somewhat increased by the "water-filling."

5. In acute otitis media, bone conduction could be slightly diminished or at least not increased by the test.

The findings in a series of more than fifty patients correspond almost exactly with those quoted from Runge; and from a practical standpoint the test appeared of especially valuable diagnostic significance in those conditions for which we seem to have no better term than the chief symptom of chronic deafness. Failure to increase bone conduction by the Runge test has occurred most frequently in those patients in whom increased bone conduction already exists, and who present other signs of stapedial fixation or of profound disturbances in the conduction mechanism. In these patients one cannot expect treatment to be of benefit. On the other hand, if bone conduction could be increased, some gain in hearing has usually been obtained.

It is more than probable that hearing is dependent on sympathetic resonance at some point in the laby-

rinth. This has been granted in all theories of hearing accepting a peripheral tone analysis, from Helmholz down. Induced or sympathetic vibrations are always of less intensity than those of the exciting force on account of a leakage of energy; therefore, when the stem of a tuning fork is placed on the bone of the head, is it not possible that we hear it by the direct creation of sympathetic resonance in that portion of the internal ear tuned to respond to the pitch of the fork used? The duration of perception is much less than by air conduction, under the law of induced vibration, even though it may be augmented in the normal ear by vibrations taken up by the conduction mechanism. If this supposition is admitted for argument only, then bone conduction may be considered as an entity, separate and distinct from physiologic air conduction, and its abnormalities may be explained as occuring not because of faulty or anomalous transmission of sound waves by the drumhead and ossicular chain, but as due to faulty or anomalous perception brought about by changes in the position of intralabyrinthe structures which must occur during forced and abnormal inward movements of the foot plate of the stapes, and the compensation movements outward of the membrane in the round window or when fixation of the stapes results in a motionless fluid within the internal ear.

The Runge experiment seems to indicate the possibility of this explanation for the following reasons:

1. To obtain a marked increase in the duration of bone conduction, it is necessary that the movements of the ossicular chain be perfectly normal.

2. No increase in the duration of bone conduction can be obtained in those persons in whom the drumhead and ossicles have been removed, or in those patients presenting evidence of complete fixation of the ossicular chain and showing either increased or normal bone conduction.

3. The amount of increase in the duration of bone conduction over the normal seems dependent on the degree of mobility of the middle ear mechanism, for in partial fixation only moderate increase in the duration of perception over the normal can be obtained.

4. Bone conduction can be doubled in duration of perception in normal and in deafened persons so long as the ossicular chain is freely movable.

5. Hearing by bone can often be elicited in patients in whom the bone conduction is negative before the "water-filling."

6. In certain persons presenting negative bone conduction for a fork on one pitch and a positive bone conduction for other forks, the fork which is not heard will remain negative on "water-filling," but the other forks may become definitely and normally increased.

The External Ear

Congenital Atresia of External Auditory Meatus. Roentgenographic examination of seven cases of bilateral malformation of the auricula and external canal prompted L. Deutsch[5] to divide his findings into two groups. The first shows a hypoplasia of the os tympanicum and a compensatory hyperplasia of the surrounding structures, especially of the processus styloideus and the mastoid. Their enlargement is at the expense of the malformed tympanic bone.

In the second group the atresia results from a concentric narrowing of the canal. Normally, the annulus tympanicus enlarges by bone deposition on its external circumference and by bone resorption in the internal lumen. If this ontogenetic sequence is disturbed, resorption may cease and result in the narrow constricted external canal.

(5) Monatschr. f. Ohrenh., 9: 993, 1925.

The Anatomy, Psychology, Diagnosis and Treatment of Congenital Malformation and Absence of the Ear. It is the belief of J. C. Beck[6] that patients having a congenital defect of the ear have a psychological feeling of depression. Whenever he has been able to improve the cosmetic appearance there has always been a marked change for the better in the mental attitude.

The anatomical study of the ear is divided into a consideration of the (1), external ear; (2), middle ear; (3), mastoid; (4), internal ear, and (5), neighboring structures. The *x*-ray studies of the mastoid have proved very interesting. Where the congenital deformity of the external ears was associated with a nonfunctioning labyrinth, there was not the least evidence of a mastoid cell and the internal auditory meatus was not outlined. Conversely, in the cases of deformed ears where the hearing was very fair, the penumatization was marked.

The author presents numerous plates showing various deformities of the ear and several series of operative procedures from some of his cases. He summarizes his experience as follows:

1. Contrary to the common but unjustified opinion of many men, is the usefulness of an operative procedure in these cases, particularly on the mind of the individual as well as the parents.

2. The radiologic findings would suggest the possibility of further investigating pneumatization in connection with the function of hearing. In the determination of the function of these ears, both of the cochlea and vestibular apparatus, one has a splendid opportunity of comparing a markedly deficient ear with one of normalcy which does not prevail in testing congenitally deaf and mute children or otherwise deafened individuals.

3. While anatomically and cosmetically perfect re-

(6) Laryngoscope, November, 1925.

sults are rarely obtained, improvement is surely demonstrable.

4. The work on this subject would not be considered finished until the embryology has been investigated and the histological examination of such a congenitally deficient ear, particularly the labyrinth, is made.

Otomycosis. Nine cases of otomycosis of the auditory canal treated by large doses of potassium are reported by J. J. Chisholm and A. C. Sutton[7]. Four additional cases reported were treated by local application only.

The fungi with which we are concerned all belong to two families—Mucoraceae and Aspergillaceae. In the latter family are included two genera, namely, Penicillium and Aspergillus, seventeen species of which are pathogenic in man. Ten different species have been reported in ear conditions, by far the most common among them being Aspergillus fumigatus. In this paper it is not intended to discuss the methods of identification of the various species. In fact, according to Castellani and Chalmers, when these saprophytes become parasites they often lose their characteristics and it may be impossible to identify a given species with certainty. As saprophytes they are extremely common: (1) Mucor being found on bread; (2) Penicillium on bread, cheese, fruits and various organic substances in a state of decomposition, and (3) Aspergillus on cereals, straw, hay, and so forth. As a result of this distribution one might suspect that housewives would perhaps be more exposed to infection than others, and this is suggested by their series of cases which includes eleven women and two men. On the other hand, most of the textbooks states that the disease occurs more often in men, and among people who live in dirty, unhygienic surroundings.

In the ear, the fungus is probably never a primary invader but occurs secondary to some other pathologic

(7) Arch. Otolaryng., December, 1925.

condition. After it has once gained a foothold, however, it may persist after the primary condition has disappeared entirely or become masked by it. In order to thrive the fungus requires moisture, and this may be supplied in the ear by the following conditions: (1) Maceration of the skin as the result of trauma or long soaking in water, (2) eczema and furunculosis of the canal, (3) slight chronic discharge from the middle ear. If the middle ear discharge is profuse, it would tend to wash the fungus out of the canal before it could gain a foothold. In chronic otitis media, with perforation of the drum and scanty discharge, the middle ear affords a good medium for its growth.

The most common symptom is dull pain. If untreated, the condition may last for years and even when there is an apparent cure, recurrence is frequent, as the spores are very resistant and long lived. In one case there was a recurrence after twenty years of comparative freedom from symptoms. The patient is an eminent bacteriologist. He identified the fungus himself, and found the same species in a cast removed from his external auditory canal twenty years after the initial attack. Two patients had recurrences after a year of absolute freedom from symptoms.

The diagnosis is based: (1) on the history. (2) on the finding of scales, flakes, crusts or thick, whitish, yellowish, or brownish discharge in the canal. The scales often adhere tightly to the canal wall and the drum, and are difficult to remove. It is usually impossible to remove them all at one sitting. In some cases, they are confined to the inner third of the canal and the drum. (3) On the red, macerated appearance of the skin after removal of the scales and crust from the canal. (4) Most important, by the finding of mycelia and spores in a smear made from the material removed. This often requires careful search. It is best to add 10 per cent. sodium hydroxid to the material, seal the cover

glass with petrolatum and allow it to stand over night in order to dissolve the abundant epithelial debris.

The employment of potassium iodid was suggested to the writers by the well known fact that it is often used as a remedy in other mycotic infections. The following plan of treatment was evolved:

1. Oral administration of potassium iodid, beginning with 5 gr. three times a day, and increasing gradually to 15 gr. or more three times a day. This course to be continued until the symptoms are relieved and the ear is free of discharge.

2. A period of ten to fourteen days, preferably under observation, during which time the patient takes no potassium iodid but is instructed to wipe out the canal daily with alcohol or with a 2 per cent. solution of salicylic acid in alcohol.

3. A fourteen day course of potassium iodid then follows, beginning with 10 gr. three times a day and rapidly increasing to the maximum dosage the patient can tolerate.

4. Rest for two weeks and repeat the fourteen day course of potassium iodid. In obstinate and long standing cases, two week courses with two week intervals between should be continued for at least six months.

5. It is important that no water should be allowed to enter the canal at any time and that no oils or ointments should be used in the ear.

Some persons develop a rash or other symptoms of iodism before the optimum dosage is reached. In such an event the dosage of potassium iodid must be kept relatively small.

The better results obtained by courses of potassium iodid are probably due to the fact that the spores are not killed by the drug, but are prevented from developing. The interval between courses allows the spores to develop into mycelia which are then killed by the next course.

In case of middle ear diseases when mycelia and

spores are found in the discharge, the question as to whether the fungus plays the primary role can be determined by a therapeutic test. All the patients who received adequate treatment as outlined in the foregoing were cured. However, when the fungus occurs merely as a secondary invader, the discharge from the middle ear will persist after mycelia and spores can no longer be found in it. In such an event the patient will then have to be treated the same as any other case of chronic middle ear suppuration.

The writers offer the following conclusion: 1. That otomycosis is more common than is usually suspected and that in consequence a correct diagnosis is not always made. This is particularly true when the middle ear is involved.

2. That it should be definitely ruled out by careful microscopic examination in all cases of eczema and recurrent furunculosis of the external auditory canal, and in atypical or long standing discharge from the middle ear, particularly when such discharge is of a brown or dirty white color.

3. That the use of large doses of potassium iodid internally is a most valuable adjunct to any form of local treatment, and that it should be given in courses over a long period of time to obtain the best results.

4. That potassium iodid should be used with caution when the patient has concomitant staphylococcic infection, because of its apparent inhibitory effect on the normal resistance to skin cocci.

5. That the disease is prone to recur after apparent cure. Therefore, to estimate the value of any form of treatment, the patient must be followed up for at least three months, preferable much longer.

[In the series of nine cases five were of the *Penicillium variety* three *Mucor* and one *Aspergillus*. In the series of four treated locally all were *Aspergillus*. It is probable that the different varieties of otomycosis respond differently to local applications

and the same may be true of their response to potassium iodid. Ordinarily the alcohol treatment will be found satisfactory especially if the auditory canal is packed with cotton and the cotton is saturated with a 95 per cent. alcohol three or four times a day.—Ed.]

Etiology of Myringitis Bullosa. An interesting study leads E. V. Ullmann* to identify myringitis bullosa as a distinct disease, an acute inflammation due to a filterable virus. It resembles herpes in that an inflammatory reaction (keratitis) is induced in rabbits by eroding and inoculating the cornea with the serum obtained from the bulla on the tympanic membrance of the patient. The serum from a bullosa myringitis occuring as a feature of an acute otitis media, on the other hand, produces no corneal reaction whatever. This coincides with the observations of Doerr who demonstrated the immunity of the rabbit cornea to streptococci, staphylococci and pneumococci.

When the myringitis-keratitis subsides, it produces an immunity which resists a second corneal inoculation. The same is true of herpes. However, that myringitis bullosa is not identical with herpes was demonstrated in the following manner. Herpes virus was inoculated into corneas that passed through a myringitis-keratitis and that later proved refractive to a second inoculation; a violent keratitis ensued.

The myringitis virus and herpes produce certain similar reactions—experimental keratitis and immunity against reinfection—yet are not identical diseases because herpes virus can infect a cornea immune by myringitis virus.

The Middle Ear

The Bacteriology of Middle-Ear Disease. E. Wirth[8] has examined 84 specimens of pus from acute middle-ear disease. The secretion was taken by paracentesis

(*) Monatschr. f. Ohrenh. 1: 41, 1926.
(8) Zentralbl. f. Bakt., June 7, 1926.

and then examined bacteriologically, particular attention being paid to the *Streptococcus mucosus*. For this purpose the pus, after microscopical examination, was enriched in liver broth and then plated on blood agar. It was noted that there was often a failure in correspondence between the morphological and the cultural characteristics of *S. mucosus*.

The author discusses the meaning of this and comes to the conclusion that the final criterion to employ in the diagnosis of this organism is the formation of the typical slimy colonies on blood agar. Great difficulty occurred in distinguishing it from the pneumococcus; five of the specimens remained sterile on culture, or contained only saprophytic organisms. On account of the difficulty he experienced in the cultivation of *S. mucosus* he is inclined to regard these cases as having been caused by this organism. His final results showed that the *S. haemolyticus* was present in 53.8 per cent. and the *S. mucosus* in 23.8 per cent. of the specimens. These findings agree fairly closely with those of other authors; the discrepancies being probably due to the different technic employed, and to the variations in seasonal incidence manifested by the *S. mucosus*.

The Problem of the Acute Ear. In summing up his experience in this type of cases T. R. Rodger[9] states that early paracentesis should be given a trial in most cases of acute ear. If any acute signs remain after 36 or 48 hours in the form of pain, tenderness or temperature, a mastoid operation should be undertaken, and it should be a complete mastoidectomy.

If paracentesis leads to complete resolution of the acute signs but a discharge persists, mastoid operation should be done after four or six weeks for the conservation of hearing to avoid the passage of the case into the class of chronic otorrhea.

(9) Canad. M. A. J., August, 1926.

Acute Suppurative Otitis Media Causing Septic Arthritis Without Observable Symptoms of Intervening Mastoiditis or of Involvement of the Lateral Sinus. Two illustrative cases are reported by F. A. Kiehle*: The boys, 8 and 10 years of age, respectively, rapidly developed a double otitis media, which in each instance progressed along the usual course. In neither was there anywhere in the body other discernable foci to account for the general infection that arose. In both the blood showed the presence of the same organism (streptococcus hemolyticus) that had been discovered in the aural discharge. But tenderness, both superficial and deep, both over the antrum and the tip, was absent. There was never the slightest indication of redness or of edema, none of the "feeling of the ear" common in children, no bulging of the posterosuperior meatal wall. The usual moderate temperature and serosanguinous discharge, changing to purulent in a few days, alone associated themselves with an otitis. The temperature took on a septic type with the manifestations of the arthritis, and no other symptom significant in any way of sinus thrombosis was present—no tautness of cervical muscles, no tender or enlarged cervical glands. In the first case recovery took place finally, whereas in the second a general septicemia developed, death occuring in five days after operation on the right femur for osteomyelitis, and eighteen days after the initial earache.

The literature gives many articles on focal infection leading to arthritis, particularly with tonsils, teeth and sinuses as the source, but invariably the ears are passed over very lightly as a possible factor in this condition.

The author believes that in both cases one may postulate a wide open aditus on each side, a lateral sinus lying far forward and susceptible to easy attack through large contiguous mastoid cells. Then a surreptitious entrance of the infected organisms into the

(*) Ann. Otol. Rhinol. & Laryng., September, 1926.

blood stream via the lateral sinus without formation of a clot, or at least with nothing more than a minute mural thrombus, in the formation of which the phenomena of the invasion of the sinus, viz., chill and septic temperature, corresponded with the appearance of the septic symptoms of the arthritis. In other words, the attack upon the joints was practically synchronous with the invasion of the lateral sinus.

In the presence of such a picture, would one have been justified in laying bare a lateral sinus, in the one case within five days and the other within eight days of the initial earache? With the courage gained from combating with questionable success the one case and with distinct failure the other, the author believes that under like circumstances the condition of the lateral sinus should certainly be investigated. In the presence of a double otitis, each ear apparently equally inoffensive, which sinus should be laid bare? Given a double otitis, the side showing the more serious symptoms is the side that should be first opened.

Etiology of Secretory Catarrh, Particularly with Nasopharyngeal Tumors. There are two views of the genesis: transudate ex vacuo and hypovirulent infection. Ruttin[1] observes that there is no specific clinical picture and no specific cause.

He differentiates as follows: (1) Tumors of the nasopharynx. (2) Rhinoscleroma, syphilitic and other cicatrices and processes leading to tubal stenosis. (3) Chronic nasopharyngeal disease. (4) Acute nasopharyngeal disease. (5) As a precursor of acute otitis. (6) As a sequel of myringitis bullosa.

In conditions resulting from tumors, the exudate may be present months or years without resulting in acute otitis media, and may exist in the presence of a permeable tube. Tumors lying below the tube, that is, malignant glands, as a rule do not cause secretory catarrh. The author believes it is a transudate result-

(1) Ztschr. f. Hals-, Nasen- u. Ohrenh., 12: 481, 1925.

ing from lymphatic and venous stasis, and exhibits specimens from a patient with a malignant condition, showing the dilated vessels.

In group 2 with stenosis of the tube, the findings are most often a thickened, retracted membrana tympani, with dry catarrh, seldom secretory catarrh. Also sometimes one finds secretory catarrh with easily inflatable tube.

Analogous to this explanation is that of plastic labyrinthitis, with hyaline exudate, due to tumor growth surrounding the labyrinth. Group 5 may be either obstruction or hypovirulent infection. Group 6 is probably combined with cerebral polyneuritis. The author quotes a case of recurrent secretory catarrh which finally developed into trigeminus neuralgia. He believes the exudate was the result of trigeminus influence on the blood and lymph vessels.

The Prognosis of Middle-Ear Suppuration in Children. Middle-ear suppuration is often regarded as a trivial ailment but is a disease of considerable importance as it is a direct cause of ill health and deafness and may even prove fatal. At autopsy it has been found in as many as 80 per cent. of infants under one year of age. In the vast majority of cases a common cold is the causative factor.

Of 129 patients with acute middle-ear suppuration which were traced by D. Guthrie[2], 78 per cent. were found free from drainage and deafness from two to five years after the original attack. Acute mastoiditis is a frequent complication after streptococcal infection but has a favorable prognosis if intracranial involvement does not occur. Of 39 patients operated upon for this condition, 75 per cent. were found to be quite well.

In chronic suppurative otitis media the outlook is distinctly less favorable. The chronicity is attributable to neglect of treatment, constant re-infection by re-

(2) Edinburgh M. J., March, 1926.

peated colds, and adenoids. Of 207 patients treated conservatively, only 57 per cent. were cured and in 15 per cent. both deafness and discharge were still present. Surgical treatment was given in 57 cases, but the results were disappointing regardless of the type of operation.

Tuberculosis otitis media was found in 22 cases. In this condition a radical operation is the only treatment to be considered.

From his observations the author concludes that the more recent the suppuration the more favorable the prognosis. The avoidance of colds in infancy is all important. Adenoids should be removed. Such attention will often prevent deafness in adult life.

The Middle Ear as a Source of Chronic Septic Absorption. According to E. Watson-Williams[3], the middle ear tract is small, but the area from which absorption can take place is as large as that of a sphenoidal sinus, and larger than that usual in an apical dental abscess. In a certain proportion of cases absorption from this region will manifest itself in disease of other parts. Every aural surgeon could produce scores of cases where great improvement in the general health has followed operative treatment of this local infection and certainly, when seeking a possible source of septic absorption, this region, very readily examined, should not be overlooked. In every case of chronic otorrhea, when the question of operative treatment arises, we should have in mind, not only the local condition, but also the actual or possible damage to the general health.

The author reports six illustrative cases where the mastoid operation was followed by relief of the general symptoms. The pre-operative conditions were respectively: "Neurasthenia," "Loss of general health," "Myalgia," "Mental changes," "Epilepsy," and "Acute nephritis."

(3) Practitioner, September, 1925.

Chronic Nonsuppurative Middle-Ear Deafness (Excluding Otosclerosis). In summing up his experience in this type of cases W. Milligan[4] states the following:

1. That clinically two types of catarrhal deafness should be recognized—the one a purely evanescent catarrhal process, the other a catarrhal process, with an accompanying mild and creeping sepsis.

2. That the presence of creeping sepsis is the underlying factor in the establishment of chronicity.

3. That maintenance of the patency of the eustachian tube is the most important factor in treatment.

4. That to effect this all obstructive or septic lesions in the throat, nose, and nasopharynx should be carefully eliminated.

5. That repeated examination and short courses of treatment are essential if the best results are to be obtained.

6. The reduction of the auditory centers should be systematized, and if possible, simplified.

7. That the main hope of preventing the onset of chronic middle-ear deafness lies in the early recognition and treatment of catarrhal and septic changes in the upper respiratory tract.

The Cholesteatoma of the Middle Ear; Its Etiology, Pathogenesis, Diagnosis and Therapy. The importance of cholesteatoma is due to its frequency. Among the 83,000 patients of the Munich and Bâle clinics there were in all 12,000, (14.5 per cent.) of chronic middle-ear suppurations and in one-third of these cases cholesteatoma was a complication. There is, therefore, an average of one cholesteatoma patient to three chronic middle-ear suppurations.

F. R. Nager[5] believes that though cholesteatoma, as a rule has to be considered a healing process, it involves great dangers because of two factors, namely, accumulation and putrid decomposition of the epider-

(4) Brit. M. J., Dec. 12, 1925.
(5) Ann. Otol. Rhinol. & Laryng., December, 1925.

mic scales. In consequence of the irregularity of the tympanum, the epidermization also extends into smaller recesses, which soon get filled up by exfoliated epidermic masses. Like a little growing ball or a sebaceous cyst (atheroma) of the scalp, the cavity filled with concentrically arranged cholesteatoma masses gets larger by pressure on the surrounding structures. The growth takes place at the cost of its environment; the bone wastes away, the occisulas get corroded (falsely designated as caries), the labyrinthine capsule or the lamina vitrea of the middle and posterior cranial fossae are destroyed. In moisture and warmth the epidermic scales form an excellent breeding place for putrid decomposition, thus causing an inflamed cavity, which lies side by side with labyrinth and dura or sinus, and involves the danger of spreading to vital organs. Moreover, through granulation tissue formations (here called polpyi), the conditions for drainage become still more unfavorable and the retention more imminent, so that the deleterious effect of the cholesteatoma is plainly evident.

The diagnosis of aural cholesteatoma is today much easier than formerly. In every chronic middle-ear suppuration with fetid secretion and epitympanic marginal perforation, cholesteatoma must be suspected. The greatest importance should be attached, when teaching otoscopy, to the distinction between epitympanic and central perforations. The fact should be made known even to the general practitioner, as are the first symptoms of glaucoma or of strangulated hernia.

The treatment of cholesteatoma must be carried out by the surgeon. Small cholesteatoma cavities with good conditions for discharge may be treated conservatively. With the help of the attic Hartmann tubes, they can be thoroughly cleaned, dried, and disinfected with boric acid powder in such a manner that neither accumulation nor putrid decomposition will occur. In

most cases (about two-thirds) this treatment will be sufficient, provided it is continued until the suppuration entirely stops.

But where the cholesteatoma cavity is large or the opening to the tympanum narrow—for instance, in Shrapnell cholesteatoma — the dangers mentioned above are existent, and the treatment must be modified accordingly. Cleansing with attic tubes is to be tried in all cases, except when there are signs of a complication or acute inflammation. When this does not bring the desired result, one should resort to the radical operation. Constant fetid discharge and desquamation of cholesteatoma masses indicate that the cavity cannot be completely cleansed or freed from the epithelial scales. Therefore, the cavity must be laid bare by operation and connected broadly with the outside.

The indications for the radical operation of cholesteatoma, according to the best judgment, are provided by the following conditions:

1. Inflammation of cholesteatoma with threatening symptoms (pain, rise of temperature, symptoms of labyrinth, dura or sinus complications).

2. Failure of the conservative treatment in spite of a consistent application during four to six weeks.

3. Constantly recurring suppuration in connection with the cholesteatoma, even when it can be stopped periodically by conservative treatment.

4. Insufficient cooperation of the patient or the impossibility of an exact conservative treatment, owing to general conditions, such as lack of ear specialists, distant places of residence, etc.

The extraction of the ossicles or exposure of the cholesteatoma cavity, starting from the meatus, need not be mentioned. Undoubtedly such minor operations will be successful in some cases, but a survey and exposure of an irregular cholesteatoma cavity will not be possible by these partial operations; therefore relapses

will be far more frequent in cases of this sort.

The radical operation is absolutely contraindicated in cases of chronic middle ear suppuration with central perforation and without cholesteatoma, because the operation endangers the hearing and, moreover, does not do away with the discharge.

The prognosis of aural cholesteatoma depends in the first instance on the timeliness of the diagnosis.

The diagnosis having been made, and the patient as well as the physician, being fully advised regarding the importance of the complaint, the dreaded complications should be more and more reduced.

[The diagnosis of cholesteatoma is made by the appearance of whitish masses in the discharge and by microscopic examination of the discharge coming from the attic. A thick smear should be made or a small particle of the whitish mass crushed on the slide. A moderately deep stain with hematoxylin leaves the epidermal cells clear with the surrounding debris deeply stained. A moderately low power objective should be used.—Ed.]

Differential Diagnosis in Operative and Nonoperative Purulent Otitis Media Chronic. T. J. Walthall[6] divides cases of purulent chronic otitis media into two groups: (1) The dangerous type; and (2) the nondangerous type.

In the first group the perforation of the drum head is marginal, and frequently the annulus tympanicus appears partly destroyed or "as if bitten away." Necrosis of portions of the ossicular chain, or adjacent antral wall is seen in some cases; in others cholesteatoma masses are found. A persistent purulent otorrhea, usually of a distinct fetid odor, is present in all of the cases. These cases are placed in the dangerous group because eventually they tend to produce intracranial or labyrinthine lesions.

(6) Texas State J. Med., May, 1926.

In the second group the perforation, although it may be large, does not involve the bony margin, and usually a small rim of membrane may be seen between the perforation and the annulus tympanicus. The discharge has no odor when the canal is kept clean, and is the product solely of disease of the mucous membrane of the tympanic cavity, eustachian tube, or from both the cavity and the tube. In this class of cases there is no danger of intracranial complications.

The author believes that the radical operation is contraindicated in the nondangerous group of cases. Here, even if the discharge continues, conservative local treatment is to be persisted in. An operation does not remove all the diseased mucous membrane, and hence serves no purpose. In the dangerous type of cases the simple measures are first tried as some of these may heal with this treatment. Failing in this the radical operation is indicated, unless the bony necrosis is limited, when ossiculectomy and tympanic curettement should first be employed.

The writer operates at once, when an acute exacerbation supervenes, or at the first sign of intralabyrinthine or intracranial involvement. Fever, pressure sensation in the head, distinctly localized, occipital headache, or nystagmus, indicates immediate operation. Facial paralysis coming on during the course of a chronic middle-ear suppuration likewise indicates immediate operation, provided no other reason for facial paralysis is present.

In necrotic bone lesions, or when cholesteatomatous masses are present in the middle-ear spaces, the operation is not immediately necessary. In unhealthy individuals, in all ill-nourished children, or in adults sick with intercurrent diseases, the radical operation may be postponed pending treatment of their general condition; during the interim, however, local care and strict supervision are necessary.

[The theory that odor in a discharging ear indicates

bone necrosis has little foundation in fact. The great number of cases of auditory canal eczema with bad odor and the number of cases of middle-ear suppuration with odor which heal promptly under appropriate treatment tend to disprove the theory. On the other hand, the theory that because a discharge is odorless the condition producing the discharge is not dangerous to the patient, has no foundation in fact. Many cases of cranial and labyrinthine complications are seen in which the discharge is odorless.—Ed.]

The Report of a Case of Hereditary Syphilitic Deafness Complicated With Bilateral Middle-Ear Suppuration and Mastoiditis. The following comments are made by G. W. Mackenzie[7] in regard to the case at point:

1. That the patient, a painter aged 34, was afflicted with labyrinthine deafness is supported by the following facts: Impairment of both bone and air conduction, together with a bilateral positive Rinne, and considerable shortening of perception for the high as well as well as the low tones.

2. That the pathologic process in the labyrinth was a diffuse and not a circumscribed one is evidenced by the negative findings from the turning and caloric tests. In fact, the loss of function in the semicircular canal apparatus was even more complete than the loss of function in the cochlea.

3. That the pathologic process was not only a bilateral diffuse labyrinthine affection but did not extend inward beyond the labyrinth is evidenced by the fact that the vestibular nerve reacted to the anodal and the cathodal current on both sides comparable with that found in individuals possessing normal labyrinths.

4. That the labyrinthine affection in this case was labyrinthitis syphilitica tarda of heredity syphilitic origin is evident from the fact that the local findings were characteristic for this disease; besides, the pa-

(7) Ann. Otol. Rhinol. & Laryng., June, 1926.

tient gave other evidences of hereditary syphilis, notably the corneal opacities, characteristic of interstitial keratitis and the so-called Hutchinson's teeth.

5. That a part of the impairment of hearing was possibly due to pathologic changes in the middle ear is suggested by the history of middle ear abscesses with mastoiditis and the aggravation of his hearing trouble, following a so-called cold, on one or two occasions. The Schwabach and Rinne tests are less dependable in this case, because the fork could not be applied satisfactorily on account of the absence of the major portion of the mastoid following the mastoid operations performed in 1910.

6. That the negative blood Wassermann in this case does not contradict the presence of syphilis is evident from the fact that it is found just as often negative as positive in the hereditary form. Browning and Cruickshank (Glasgow Medical Journal, XXXIX, 81, 172) found, in a large series of cases of congenital deafness from syphilis, that the reaction was negative in fully 50 per cent.

7. That the deafness was progressive in spite of treatment merely shows that the disease was behaving "true to form" in this case as it does in the majority of this kind.

8. That the operations on the mastoids in this case had nothing to do with the patient's deafness is self-evident, since the hearing defect was due to a different and explainable lesion in the inner ear—labyrinthitis syphilitica tarda; while the element of obstructive deafness was almost negligible. It is possible it might have been more pronounced had the mastoids not been operated on.

Although the combination found in this case is a comparatively rare one, in the aggregate there are probably quite a few others just like it.

Successful Treatment of Chronic Discharging Ears and Allied Conditions by Means of Zinc Ionization.

According to J. C. McCoy[8] this method of treatment has proved very useful in cases of subacute and chronic discharge where the perforation is central and where numerous other methods have failed. It is not successful in cases where the perforation is marginal and there is bone necrosis with foul smelling pus. Before beginning the treatment an *x*-ray picture should be taken to exclude cavitation and sequestrum.

Zinc ionization is practiced in the following way: The ear is thoroughly cleansed with warm water. A pledget of cotton containing 4 per cent. cocain solution is then applied to the middle ear for a period of 5 to 10 minutes. The patient is then placed upon a table with the diseased ear upward. After the pledget of cotton has been removed from the ear, the ear is filled with a 1 or 2 per cent. zinc sulphate solution and the zinc electrode attached to the positive pole is placed in the ear through a vulcanite speculum so that the zinc electrode and the zinc sulphate solution are in contact. The patient is then given the other pole to hold in the hand, or it is applied to the arm, being very wet with a saline solution. The current is then turned on very gradually until a strength of 3 ma. is reached. This is allowed to continue for 10 minutes, when the current is very gradually turned off.

Unpleasant effects sometimes take place in the shape of slight dizziness or slight pain in the region of the eustachian tube, but they are very evanescent. By this method the writer has treated 18 cases with results that were surprisingly gratifying, the patient's ear condition drying up in from two to six treatments, the treatments being administered once every four or five days.

Vaccine in Treatment of Affections of the Ear. H. M. Hemeleers[9] has excellent results from vaccine therapy of furunculosis in the auditory canal. He de-

(8) Laryngoscope, June, 1926.
(9) Arch. méd. belges, 79: 241, 1926.

clares that this is the sovereign remedy, as he has demonstrated in numerous cases, some long rebellious to other measures. As soon as pus has formed, the author makes a deep and wide incision, and a drop of pus is used for preparation of an autogenous vaccine. A dose of 0.25 c.c. is injected subcutaneously the first day; 0.5 c.c. the second, 1 c.c. the third and the next three or four days. By this time the healing was complete, while under the usual measures the affection usually persisted long and was liable to recur.

Vaccine treatment was also effectual in suppurating hematomas of the external ear. After the sac was cleaned out, it was filled with bouillon vaccine for ten minutes; then emptied and packed with gauze impregnated with the same vaccine. A dressing was applied above. This was repeated daily, for a few days. A case is described of a large suppurating hematoma of the external ear in which the pus disappeared entirely after three applications of a bouillon vaccine. The cure was complete by the tenth day, and there was very litle disfigurement of the ear.

Mastoiditis and Complications

Discussion of Acute Otitis Media with Mastoiditis. R. A. Barlow[1] believes that:

1. Paracentesis is not infallible as a preventive for mastoiditis.

2. Virulence of infection, anatomical configuration of the temporal bone, and general resistance of the patient are determining factors in the development of mastoiditis.

3. No rule can be set as to the necessity of operation, as each case is a law in itself. Common sense and judgment are more important in deciding this matter than laboratory data.

4. If the mastoid is to be operated on, the infected

(1) Wisconsin M. J., February, 1926.

bone should be thoroughly cleaned. Small cells or pockets must not be left to harbor infection.

5. A loose postoperative pack is as effective as a tight pack.

6. A better scar will result when the upper part of the wound is closed and only the lower portion left open for drainage.

The Roentgen-Ray Picture of the Mastoid and Its Clinical Interpretation. Three hundred temporal bones of nondiseased subjects, decalcified and sectioned, show marked agreement of the finding with the previous readings of distribution of the cells, abnormal cell structure, position of the sinus, course of the emissary, and so forth.

In some, deep lying cells which were overlayed by compact bone escaped detection. Veiling of well developed cells sometimes occurred through a thick cortex. Such pictures, according to Steurer[2] may be very misleading.

In Tubingen, in the last two years, 1,400 pictures were made for diagnostic and prognostic purposes. The pictures were especially valuable in the masked cases of *Streptococcus mucosus* and pneumococcus infection by revealing cell destruction when clinical symptoms were scant.

Orientation is easier if a picture is taken early in the disease for comparison with later ones; failing in this, the normal side may be taken for comparison. In 737 patients, 527 showed identical structure on both sides. Irregular or imperfect pneumatization and thick walls may cause great difficulty in interpretation. Cholesteatoma may be diagnosed and outlined, and erosions of the sulcus toward the middle fossa may be diagnosed. In 42 cholesteatoma cases, the extent was shown in 31.

Report of Three Cases of Primary Acute Mastoiditis. S. J. Kopetzky and R. Almour[3] found this condition

(2) Ztschr. f. Hals-, Nasen- u. Ohrenh., 12: 504 (Supplement) 1925.
(3) Laryngoscope, October, 1925.

occuring in a woman, aged 65; a man, aged 58, and a child of 8 years.

The three cases presented the following factors in common:

1. An absence of any aural disease prior to the present.

2. The finding of a normal membrana tympani at all stages of the disease.

3. The failure of the disease to produce even a moderate local or constitutional reaction.

4. The finding of a subperiosteal abscess and a perforated cortex.

5. An erosion of the inner table with an involvement of either the sinus or dura.

Cases such as these have been noted by Phillips, Perkins, Friesner and Beeger. They consider that the infection in passing from the pharynx into the mastoid process skips the middle ear, and by forming excessive granulations in the mastoid antrum, mechanically blocks the mastoid process and isolates it from the tympanic cavity.

[It is generally conceded and the conclusion seems justified that in practically all the so-called cases of primary mastoid suppuration the infection reaches the mastoid through the eustachian tube and middle ear. The fact that the middle-ear symptoms are slight or entirely absent does not make these cases essentially different from mastoid suppuration secondary to suppuration within the middle ear.—Ed.]

Six Cases of Definite Mastoiditis in Which the Middle Ear was Definitely not Affected. Six cases of definite mastoiditis, in which the middle ear apparently was not affected, have been observed in the Mayo Clinic by B. E. Hempstead[4] The incidence of this condition is low as compared with more than 500 cases in which the middle ear was obviously affected during the same period. The term primary mastoiditis, as it has

(4) Ann. Otol. Rhinol. & Laryng., June, 1926.

been designated in the literature, is misleading in such cases since the infection must be primary in the mastoid cells, and not secondary to inflammation of the middle ear that has cleared up. It is possible to conceive of a blood borne infection, after a severe local injury, as in osteomyelitis of other bones, although there is no more reason to expect such an infection in the mastoid than in other cavities, for example, the accessory sinuses.

In Cases 2 and 3 there was a history of an antecedent pain in the ear which disappeared without treatment in a very short time (less than an hour in Case 2). The symptoms directing attention to the mastoid was the swelling over the mastoid process. The indolent type of infection, followed by the formation of the subperiosteal abscess, could not explain the absence of pain as a prominent symptom. The anatomic conformation of the mastoid process may have been a factor, because the aditus ad antrum was very small. It was evident that these cases could not be grouped in those of blood borne infection. In all cases the structures of the ear and the tympanic membranes were negative on physical examination. In Case 2 a marked fulness of the superior wall of the canal externally to the isthmus was noted. One usually expects to encounter drooping beyond the isthmus.

While the study of these cases of mastoiditis without apparent involvement of the middle ear does not permit definite conclusions, it indicates the existence of an antecedent otitis media without symptoms. The roentgen-ray examination is important. The predominence of the streptococcus mucosus in these cases warns of the danger in this type of infection and puts one on guard when the organism is found in the acutely discharging ear.

Atypical Mastoiditis; Report of Three Cases with Operation. From his experience in the three cases

which he presents, J. J. McLoone[5] summarizes his views as follows:

1. In mastoid surgery the most extensive pathologic changes are sometimes encountered in cases without alarming clinical symptoms.

2. One must constantly be on the lookout for the atypical case of mastoiditis; otherwise, there will be danger of the development of dangerous complications before the condition is recognized.

3. There are many observations on record to prove that mastoiditis may occur without any apparent preceding otitis media.

4. Pain is the most trustworthy of the symptoms of mastoid suppuration, but even this evidence may be altogether lacking in atypical cases.

5. In atypical cases there may be no tenderness even on firm pressure over the mastoid process, notwithstanding the presence of advanced disease within the bone. The sclerosed type of mastoid with but few pneumatic cells and the mastoid with a very thick external cortical layer are the types which are likely to be free from tenderness.

6. Fever, leukocytosis and edema over the mastoid are ordinarily absent in atypical cases.

7. Sagging of the posterosuperior wall of the auditory canal is an important sign of mastoiditis, when present, but this sign may be wanting.

8. Deafness is apt to be more pronounced in the atypical than in the typical case of mastoiditis.

9. The *x*-ray findings are of great assistance in the suspected case of mastoiditis. In each of the author's cases, the roentgenogram was of decisive importance in the diagnosis. An *x*-ray picture of the mastoid processes should be taken even in the frank case of suppuration, in order that one may know before operation the anatomic structure of the particular mastoid with which he is dealing, the probable extent of the destruc-

(5) Laryngoscope, June, 1926.

tive process, and the position of the lateral sinus.

Mastoiditis Without Apparent Otitis Media. Two cases of mastoididtis without apparent otitis are reported by F. K. Hansel[6]. The term primary mastoiditis, as it has been used to designate this type of infection, is misleading, since it implies an involvement primarily in the mastoid and not secondary to an infection that has passed through the eustachian tube and middle ear. It is generally agreed that the infection enters the mastoid by this route. Involvement of the middle ear may produce no symptoms or signs. The infection spreads to the mastoid through the aditus ad antrum, and if this passage is small, it becomes occluded. The infection in the middle ear subsides because of drainage through the eustachian tube, and that in the mastoid continues, to the destruction of the cellular structure.

Mastoiditis without apparent otitis media should not be confused with latent suppurative otitis media. In these cases there is deafness and sometimes pain, but no spontaneous discharge of pus. The tympanic membrane is without lustre, full and sometimes markedly bulging, and paracentesis is always followed by the discharge of pus. Streptococcus mucosus is particularly prone to cause this type of infection. Mastoid involvement and other complications may or may not be present, whereas in the cases of mastoiditis without apparent otitis media, paracentesis is never followed by the discharge of pus.

In the absence of middle ear symptoms. the advent of the mastoiditis may be marked by local and constitutional reactions in the form of swelling over the mastoid process, fever, leukocytosis and definite destruction of the cellular structures, as noted by the roentgen-ray plates.

In attempting to explain this unusual type of involvement, it is necessary to assume that certain pro-

(6) Arch. Otolargyng., May, 1926.

cesses take place. While we are unable to submit definite proof, there are certain explanations which seem plausible.

We know that otitis media and mastoiditis practically always occur as complications of an acute bacterial infection of the nose and throat. There is every reason to believe that this infection passes through the eustachian tube to the middle ear and mastoid, in which an inflammatory process ensues. The eustachian tube, the middle ear along the anterior half of its floor and the region of the tubal orifice are lined with ciliated epithelium, which tends to propel invading bacteria into the nasopharynx. When this barrier to invasion is overcome, either by lowered tissue resistance, inflammatory reaction or virulent bacteria, the infection enters the middle ear, and since most of this cavity is lined with squamous epithelium there is very little protective mechanism to prevent the spread of infection to the mastoid cells.

We see cases of otitis media in which there is only the slightest inflammatory reaction in the drum which undergoes resolution without producing any further pathologic change. In these cases the eustachian tube probably acts as a means of drainage. We also see cases in which the accumulation of exudate in the middle ear progresses to the point at which paracentesis or spontaneous rupture of the drum is necessary for drainage. When this is established, even though there is also mastoid involvement, the infective process may undergo resolution. Sometimes, on the other hand, in spite of the draining, there is a profuse discharge, coming mostly from the mastoid cells, which does not undergo resolution. In these cases it is necessary to open the mastoid. Now if we suppose that the aditus ad antrum becomes closed off, the suppurative process in the mastoid may progress while it subsides in the middle ear. That is what occurs in latent otitis media. In mastoiditis without apparent otitis media, there is

every reason to believe that in passing through the middle ear the bacteria do not produce any demonstrable pathology in this cavity; or, if they do, it is so slight that resolution immediately occurs. If we had the opportunity to observe these cases from the very onset, the probability is that some minor changes in the drum would be observed at some time in the course of the disease. It seems plausible to assume that if the aditus ad antrum is small or becomes obstructed by inflammatory involvement, the mastoid and middle ear become completely disconnected. The inflammatory process progresses in the mastoid without any demonstrable pathology existing in the middle ear.

It would seem that this type of mastoid disease is dependent on the anatomic peculiarities which exist in the mastoid process, rather than due to some specific organism.

The marked destruction of the cellular structure of the mastoid could be accounted for on the basis of pressure necrosis as well as of the activity of the bacterial infection. The danger in cases of this type lies in the failure to recognize and estimate the mastoid involvement. The marked destruction of bone increases the possibility of subperiostal abscess, sinus involvement and intracranial complications.

[One of the best aids in diagnosis in these obscure cases of mastoiditis is transillumination. A brilliant light confined to a small area behind the ear and a speculum in the canal should show illumination of the posterior canal wall. The progress of the mastoid either toward recovery or toward disintegration can be watched. It should be used as routine practice in all cases of suspected mastoid disease.—Ed.]

Indications for Mastoid Operation. From a study of the symptoms, and from his own experience, S. G. Dabney[7] outlines the indications for mastoid operation as follows: It is assumed that there is a free opening

(7) Am. J. Surg., April, 1926.

in the drum membrane, and that proper treatment of the otitis media has been instituted. (2) Laboratory findings alone never warrant mastoid operation. In the order of their value they are: (a) bacteriology of the spinal fluid if meningitis is suspected; (b) the roentgen-ray picture; (c) bacteriological examination of the discharge; (d) the blood count. (2) Except where there is edema over the mastoid or cerebral symptoms (both very unusual at this time), operation is rarely indicated in the first week or ten days of otitis media. (3) The persistence of even slight symptoms, or their appearance after this date, often demands operation; these symptoms occur in various combinations. As a rule, the following conditions continuing beyond the above-mentioned time or arising after that time, indicate the need for operation:

1. Persistent pain and tenderness with slight evening rise of temperature;

2. Profuse purulent discharge without pain or fever and with slight if any tenderness, but with sagging of the upper posterior wall and drum adjacent;

3. Moderate or profuse discharge with edema of the mastoid;

4. Marked fluctuation of temperature with chill and sweats,—a combination very suggestive of septic thrombosis of the sinus, but sometimes occuring from mastoiditis alone, especially in children;

5. Profuse purulent discharge continuing for several weeks;

6. Rarely, sudden cessation of discharge with the onset of septic symptoms.

Radical Mastoid Surgery; End-Results. E. M. Seydell* divides cases of chronic otitis media into: (1) nondangerous, (2) dangerous, and (3) cholesteatoma. Upon this classification depends the mode of treatment. Accordingly the author states that:

1. The radical mastoid operation should not be em-

(*) Ann. Otol. Rhinol. & Laryng., Septembr, 1926.

ployed in the nondangerous type of chronic suppurative otitis media.

2. In the dangerous type every means should be employed to remove the pathologic conditions before resorting to the radical mastoid operation. Where the disease is limited to the attic a meatal operation should be considered.

3. If a cholesteatoma is the cause of the chronic suppuration, nothing short of an operation will bring about a permanent cure. If this condition is localized in the attic, a meatal operation should also be considered.

4. The radical mastoid operation should never be performed with the object of increasing a patient's hearing.

5. A dry ear may usually be expected, but it is only of secondary importance.

6. The patient may be assured that if no intracranial complication exists at the time of the operation, none will later arise, providing proper after treatment is instituted.

7. Patients must be seen by their otologist from time to time for several years subsequent to the operation.

Acute Mastoiditis, Lateral Sinus Thrombosis and Pyemia. A case of acute mastoiditis complicated by lateral sinus thrombosis and pyemia is reported by S. D. Greenfield[8]. This case presents several interesting features.

1. This patient never showed a positive blood culture, despite the fact that here was such extensive disease demonstrable at operation. Furthermore, one should expect a positive blood culture when a condition runs a pyemic course. Cases of sinus thrombosis do occur without obtaining a positive culture. Due care was exercised in taking the specimens of blood when the circulation was more apt to contain most bacteria.

(8) Arch. Otolargyng., May, 1926.

which, it is agreed, is at the time immediately following the chill or when the temperature is at its maximum. Yet even with these precautions, the blood cultures remained persistently negative.

2. After ligation of the internal jugular vein and establishing drainage from the lateral sinus, it was evident that the infectious focus was not entirely excluded from the circulation. No free flow of blood was obtained from the bulbar end, and one, therefore, is compelled to believe that the communication with the general circulation continued to be somewhat maintained by the inferior petrosal sinus which enters the lateral sinus just below the bulb. It is probably through this source that the emboli gained entrance to the general circulation.

3. At the time of operation the sinus plate seemed unbroken, and yet the infectious process entered the lateral sinus at some point between the knee and the bulb. This, it is reasonable to suppose, in view of the fact that the preceding original extrasinus infection (which in this instance was the large perisinous abscess), was here located. The process must have made its way into the sinus either through a microscopic break in the plate or through the diploetic veins.

4. This case bears out a well known clinical observation that cases of lateral sinus infection in which metastases to the joints and superficial tissues occur are more apt to survive. This patient had involvement of the left hip joint, the left ankle joint and the soft tissues about the right femur.

[In this case the sinus was opened, cleaned out and packed with iodoform gauze. The jugular vein was ligated below the facial vein and the neck wound closed. Thirteen to twenty days later large pyemic abscesses were opened. One wonders what the result would have been had the jugular been opened above

the facial and vein opened for drainage from above. —Ed.]

Mastoiditis and Its Complications. This paper is a review by W. M. Munby and R. E. Jowett[9] of over 800 cases of mastoiditis operated on in the Leeds General Infirmary during the past six and a half years. In almost every case the operation was performed for an urgent condition, such as acute mastoiditis, obvious cholesteatoma causing symptoms, or recurrent polypi with pain. On account of the difficulties of hospital accommodation, the simple mastoid operation for the cure of persistent otorrhea of short standing or the radical operation for chronic otorrhea has been rarely performed. In all but a few of the fatal cases a report of the necropsy has been available.

For purposes of discussion the cases have been classified as follows:

1. *Complicated Cases*: Mastoiditis with, in addition, brain abscess, sinus thrombosis, or meningitis.
2. *Uncomplicated Cases*:
   (*a*) The simple acute or chronic case which runs a straightforward course.
   (*b*) Cases with extradural abscess and no further lesion.
   (*c*) Cases of tuberculous mastoiditis.

The signs and symptoms in any given case vary enormously, and it is impossible to divide the course of the disease into stages, as has been frequently attempted. Intracranial abscess defies rule-of-thumb methods of diagnosis, and exploration is frequently justified by the presence of one sign or symptom alone. A few notes on the reliability of certain features of the symtomatology are, however, worthy of consideration.

General muscular wasting is a more prominent sign in cerebellar than in temporo-sphenoidal abscess. Cerebral hebetude and irritability are by no means common,

(9) Brit. M. J., July 17, 1926.

but in some cases slow cerebration does occur. The majority of patients are quite rational, complaining only of weakness and loss of physical and mental energy. The semicomatose condition occuring in the late stages is most frequently seen in association with meningeal signs. Headache of distracting severity is the commonest symptom. It is not necessarily localized, but is often frontal and bilateral. An extradural abscess or sinus thrombosis will cause headache of equal severity, but persistence of this symptom after treatment of such a lesion would justify an exploratory brain puncture. Vomiting is inconstant, is not often effortless, and sometimes occurs after meals, simulating a food vomit. The temperature chart is a most unreliable guide.

The diagnosis of tempero-sphenoidal abscess condition presents less difficulty than that of cerebellar abscess.

As regards treatment the mastoid operation is first performed, either simple or radical according to the indications present. The dura mater is then exposed in either the posterior or middle fossa. In doubtful cases the direction of spread of the bone disease is helpful as an indication which fossae to expose and explore. Frequently a localized pachymeningitis externa or fistula will indicate the spot for exploration. A large-bored Gauvin's needle or a thin-bladed scalpel can be used. In those cases where pus is not immediately evacuated the brain can be explored in several directions to a depth of one and a half inches, and some reliance may be placed on an odor clinging to the exploring instrument after withdrawal, if pus has not been immediately evacuated. Whether puncture is performed in front of or behind the later sinus in cerebellar abscesses depends upon the position of the sinus, but for drainage the posterior route is the more satisfactory. If successful the opening in the dura mater is enlarged to admit a rubber drainage tube one-third

of an inch in external diameter with a moderate bore, with the end turned back like a flange to make it self-retaining, as advised by Dundas-Grant. Cerebellar abscess is difficult to drain, as the tube becomes blocked with diffluent brain matter and there is a liability to kinking of the rubber tube. A medium sized Parker's tracheotomy tube is appropriate by reason of its curve and length, and can be held in position by means of tapes. The posterior wound is closed as far as possible, or lightly packed with gauze. On account of the small opening in the dura mater and bone obtained by this method of access no trouble has been experienced in the way of hernia cerebri.

The prognosis of brain abscess is very serious. In the authors' case the mortality rate for temporo-sphenoidal abscess is 63 per cent., compared with 80 per cent. in the series which was described by Hunter Tod. This figure renders an opinion as to the ultimate result impossible in any individual case, and the chance of recovery seems to be almost as good in the cases with meningeal symptoms as in those without.

In cerebellar abscesses the prognosis is even worse, and in the present series the mortality rate was 88 per cent. In the author's cases sinus thrombosis was a concommitant complication in 33 per cent. of the cerebellar abscesses and 15 per cent. of the temporo-sphenoidal. This increased frequency in cerebellar abscesses is explained by the fact that the lateral sinus is a very frequent source of cerebellar infection. This point is of great practical interest in the consideration of the brain lesion, where the symptoms of sinus thrombosis may mask those of the brain abscess, or their urgency result in an insufficient examination of the available signs before, during, or after operation. Recovery took place in two of these double lesions. This association may also be expressed by stating that in fifty-seven cases of sinus thrombosis brain abscess occurred sixteen times (30 per cent.). Combined cerebral

and cerebellar abscesses have not occurred. Three cases of occipital abscess have been discovered at necropsy.

Lateral sinus thrombosis alone occurs in about 5 per cent. of all cases of mastoiditis, and is more common in the course of chronic than acute disease, although in this relation the difference in incidence is not so marked as in the case of brain abscess. The mortality is 75 per cent.

Exploration of the sinus must not be postponed long in those acute cases with intermittent temperature, even though the condition of the sinus, if this was exposed at a previous operation, did not seem to indicate it. Thrombosis can be present in a pulsating sinus which has a normal tunica adventitia. Exploration by incision is the only satisfactory method.

The bulk of the enormous literature on sinus thrombosis concerns ligature of the jugular vein and the indications for it. Recently Laurens has condemned the procedure as unnecessary, and there are grounds for this statement. There is not much difference in the mortality rate between the series in which it was tried and that in which it was not. In the author's opinion the indications for ligature are few, but can be well defined, and there is no question as to the usefulness of the procedure in cases where these indications are present.

Purulent meningitis, uncomplicated, is the most uncommon complication, and occurred in only fifteen cases—an incidence of 1.75 per cent. "Serous" meningitis was found in six other cases, which were operated upon with good result.

The mortality rate in the uncomplicated cases is 2.25 per cent. Nine out of a total of fifteen deaths were cases of tuberculous mastoiditis. Excluding these the mortality becomes 0.9 per cent., which is a figure representing the operative risk. One nephritic case died of pulmonary edema, two rachitic children

of acidosis, and one patient of bronchopneumonia. Autopsies were not available in the other two cases. A review of the cases as a whole presents no feature of interest.

In conclusion the authors emphasize:

1. The importance of regarding meningeal symptoms as an indication for operative intervention rather than a contraindication.

2. The necessity for brain exploration in doubtful cases.

3. Examination for multiple complications in any complicated case.

4. Early sinus exploration in cases of acute mastoiditis where, especially in children, thrombosis tends to be "quiet" lesion.

5. The need for education to an appreciation of the danger signal in chronic suppurative otitis media equal to that obtaining at the present time in intra-abdominal disease.

Bacteriology of Otogenic Meningitis. H. Neumann[1] reports 119 cases. One hundred and one were nonbacillary, eighteen polybacillary, of which only one followed acute ear trouble. Of the seventeen polybacillary cases which followed chronic ear suppuration, fifteen had more than one intracranial complication, as did thirty-four of the chronic with monobacillary infection and sixteen of the acute.

Of the monobacillary the principal offenders were: *Streptococcus pyogenes*, 45 times; *Streptococcus mucosus*, 22 times; *Diplococcus pneumoniae*, 16 times; *Staphylococcus pyogenes*, 4 times; *Obligatory anaerobe*, 3 times; Diplostreptococcus and *Streptococcus lanceolatus*, 2 each; gram-positive cocci; gram-negative cocci, coli commune, pyocyaneus, 1 each.

The author believes that complications occur only during acute exacerbations, and reports the case of a patient with discharge from the ears in which two

(1) Ztschr. f. Hals-, Nasen- u. Ohrenh., 12: 165, 1925.

neurologists had diagnosed temporal lobe abscess and on whom he refused to operate because of absence of acute symptoms in the ear. The patient made a good recovery.

The author believes bacterial differentiation will prove valuable in the serologic treatment of meningitis, which he thinks is our best hope for the future.

The Curability of Septic Purulent Meningitis of Otitic Origin. After considering the surgical treatment of the middle and internal ear and its adnexa, Maloens[2] advocates liberal lumbar puncture repeated often, together with serotherapy and vaccine therapy.

Chemotherapy by intra-arachnoid injections is advised, and systematic medication with hexamin, which he considers is the best medication to be used. The author considers the various therapeutic measures such as collargol, lysol, sodium salicylate and potassium iodid and iodoform. He quotes Crowe as saying "that hexamin administered by the mouth can be detected in the arachnoid spaces in from 30 to 60 minutes after it was administered." It inoculates the cerebrospinal fluid and inhibits the development of micro-organisms.

The writer decries the attempt to treat the arachnoid spaces via the spinal canal, and thinks the blood stream the route of attack for infection in the meninges.

In conclusion the author states that:

1. Every one is in accord with the utility of copious evacuations of the cerebrospinal fluid, which produces, (a) decompression of the central nervous system, bringing a relief of the internal cerebral and bulbar blood circulation which, if not relieved, will cause metabolic changes in the form of acidosis and autointoxication producing asphyxia and disorganization of the nervous elements; (b) eliminating as much as possible infection and destructive toxins; (c) encouraging the formation of fresh cerebrospinal fluid as a true lavage to the arachnoid spaces; (d) the encouragement

(2) Rev. de. laryngol., 46: 717, 1925.

of a maximum quantity of blood antibodies, antiseptics and autotoxins medicinally.

2. Among these medications, hexamin is recommended (formic iodid), as it is a valuable agent by reason of the rapidity of its diffusibility in the whole economy, its intense action and absolute innocuity.

3. Chemotherapy by the intraveneous route is advised.

4. Injections into the spinal canal is rejected as useless.

5. Local applications of hexamin in operative wounds.

The author reports the recovery of a woman, aged 29, who had purulent meningitis following an acute attack of labyrinthitis.

Cisterna Drainage in the Therapy of Otogenic Meningitis. M.Georke[3] advises drainage of the cisterna pontis lateralis. He proceeds by uncovering widely the dura of the posterior and middle fossae (following the usual radical mastoid operation) which are joined by removing the angle of the pyramid. This gives better access to the field. He also uncovers the posterior fossa behind the sinus and downward as far as the lower knee thereof for the same purpose. He then removes the petrosa as far as the labyrinth capsule (Bogengang massif; posterior canal prominence).

The dura is then elevated with a septum elevator along the angle of the pyramid as far as the internal auditory meatus, and downward to the bulbus jugularis. A 1 cm. incision is made in the dura between the meatus and the apertura interna, which lies 8 mm. deeper. This is followed by a profuse gush of liquor, and a gauze drain is quickly inserted. If a labyrinth operation is indicated, the cisterna is located with greater certainty by following the usual labyrinth operation through to the meatus.

The author states that this procedure is rational as

(3) Ztschr. f. Hals-, Nasen- u. Ohrenh., 12: 144, 1925.

it follows the route of the infection, gives free and persistent drainage, without danger of brain prolapse, and an opportunity to discover the route of the infection, and associated pathology, such as sinus, phlebitis or cerebellar abscess, if present.

He has operated on five patients, with two recoveries, and alleviation of the symptoms of the others (cultures of the spinal fluid are not reported).

Septicemia of Otitic Origin. In this article F. E. Hasty[4] reports seven cases illustrating the following points:

1. The temperature chart is the most valuable source of information.
2. Blood cultures should be made when the temperature aproaches its highest point.
3. A diagnosis is arrived at by (a) temperature chart, (b) blood culture, and (c) a satisfactory process of elimination.
4. An early diagnosis is of paramount importance.
5. The time consumed in doing the surgery is an important factor in the prognosis.
6. The jugular bulb should be thoroughly explored.
7. (a) The jugular vein should be ligated above the facial vein, and (b) the neck wound should not be closed.
8. Postoperative treatment consists of (a) rest, (b) nourishment, and (c) blood transfusion, early and frequently repeated.
9. Finally septicemia of otitic origin offers a fair prognosis if diagnosed and properly managed.

The Modified Radical Mastoid Operation in the Treatment of Subacute Mastoiditis. A modification of the so-called Heath operation is proposed by T. H. Odeneal[5]. The operation as he performs it is simply an exenteration of the mastoid and the taking down of the posterior meatal wall as far as the tympanic ring;

(4) South. M. J., July, 1926.
(5) Arch Otolaryng., January, 1926.

the ossicles are not exposed. A flap simply of two horizontal incisions is made in the membranous meatal wall, the flap is shaved down thin, folded back on itself and stitched to the anterior lip of the mastoid incision. It is not necessary to extend the incision into the cartiliginous portion of the ear.

After the flap is sutured in place the mastoid is packed with plain gauze and the end brought out through the meatus, when the mastoid incision is closed entirely. If the ear has been discharging profusely before operation, a small wick should be left for a few days in the inferior angle of the mastoid wound to facilitate drainage, after which it can be removed.

When the incision is extended into the cartilage of the ear in making the flap, the danger of a perichondritis developing is real, and for that reason alone it is not recommended to include the cartilage in the flap incision. This complication is rare, but its danger is to be borne in mind as when it does occur a deformity is left, although the Jansen method of early excision of a segment of cartilage from the auricle will, as a rule, retard the process.

He always employs plain gauze for packing after a mastoidectomy (except when the dura or sinus is exposed) believing idoform gauze is irritating and that this irritation is at the bottom of erysipelas when it occurs as a complication.

After complete healing has taken place, in the majority of cases the mastoid cavity is filled with solid bone, leaving a wide meatus with the posterior wall smooth, so that it is impossible to determine whether a flap operation has been performed. In some cases a cavity is left when the mastoid has not refilled, and then there is direct communication between the meatus and the mastoid antrum. No trouble is experienced with granulations forming.

The first packing is allowed to remain three or four days when no further packing is required. It is his

custom to fill the cavity through the meatus every second day with 1:500 acriflavin solution, previously cleansing the canal.

If this method is followed out on selected cases, many would be saved from a radical operation although he does not recommend it for chronic suppuration. Later complications, such as sigmoidal sinusitis and meningitis, would often be prevented, as these complications are often secondary to a mastoidectomy when the cavity has not completely refilled and the external wound is allowed to heal too soon.

A Skin-Periosteal Flap for the Radical Mastoid. The technic of this procedure described by D. C. Smyth[6] is as follows:

After the ear has been prepared in the regular manner for operation, a gauze wick saturated with 7 per cent. tincture of iodin is placed in the canal for about half a minute; this is removed and followed by a gauze wick saturated with alcohol, for about a minute. The canal is then thoroughly dried out and the primary incision made. This incision is shown in drawing A, Plate XVIII.

A canal knife is introduced along the superior canal wall to the promontory, and an incision is carried outward along the superior canal wall to the external orifice. This cut must be carried through the periosteum to the bone; the knife is then turned over and the same procedure is followed on the inferior canal wall, again making sure that the incision is carried through the periosteum right down to the bone. The canal is now temporarily packed with gauze and left for the time being. The regular mastoid incision is now made down to the periosteum, but not through it; and the subcutaneous tissues are then dissected forward, the ear being held forward with some tension by the assistant. As the tissues are dissected forward, the posterior cartilaginous canal comes into view, as shown in

(6) Ann. Otol. Rhinol. & Laryng., June, 1926.

B, Plate XVIII; and at the junction of the cartilaginous and bony canal the knife is carried directly through this incision will meet and intersect the original incisions in the external canal. From the two points of intersection of these incisions, as shown in *A*, Plate XIX, incisions are carried backward through the periosteum over the mastoid to the edge of the posterior incision. With an ordinary submucous elevator the periosteum of the mastoid is easily undermined, working from these incisions toward the center.

Next, directly back of the bony canal, which now shows up plainly in the field of operation, a small buttonhole is made in the periosteum. Introducing a sharp septum dissector through this buttonhole and following down under the skin of the posterior canal wall, it is easily lifted from the underlying bone; the only point at which difficulty may be experienced for a short time is directly over the spine, where the tissues are very adherent. Having freed up the skin of the posterior canal the whole flap consisting of the periosteum over the mastoid, having at its distal end the skin of the posterior bony canal, now easily lifts out and backward, as shown in *B*, Plate XIX, giving a wonderful view of the operative field.

The radical operation is now performed. Then the skin flap is placed so that the tip of it reaches just short of the aditus, and it may be necessary to make short cuts through the periosteal flap at its upper posterior attachments, in order to have it lie nicely in place in the bowl of the cavity. The next procedure is the splitting outward of the cartilaginous canal wall through the concha, as seen in *B*, Plate XX. It is not necessary to remove the cartilage, for having carried the incision the necessary distance, especially the lower incision, through the concha so that the little finger may be easily thrust through the canal, several No. 1 catgut sutures are introduced into the subcutaneous

tissues of the concha and posterior lip of the mastoid wound and tied. These sutures hold the canal widely open.

Of late the author has in addition introduced a small skin graft. The cavity is then packed gently with gauze. This is removed after three or four days and the cavity dressed with sterile vaseline.

As regards the results, so far all the cases which have been done, varying from six months to six years ago, are dry and have no moisture in the middle ear. In not one of the cases operated on was there any pus discharge from the cavity, using the treatment outlined above. The author reports seven cases, giving the salient points of each case.

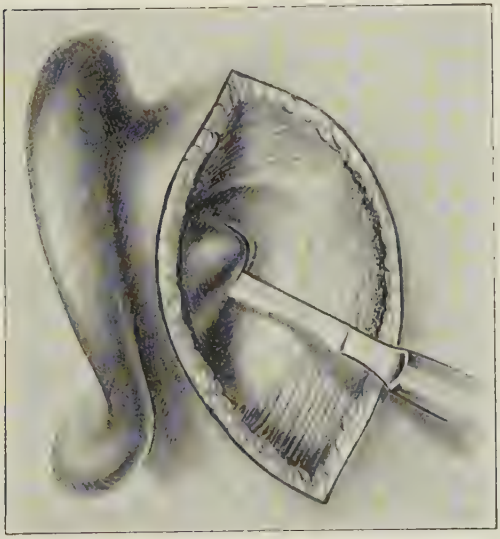
An Investigation of the End-Results of Sixty Cases of Radical Mastoid Operation, with Special Reference to Hearing. J. A. Keen[7] studied sixty cases of radical mastoidectomy to determine what hearing power, if any, was preserved after the operation. His patients were children between the ages of 7 and 16 years. The tests used were the conversational voice and watch tests. Both were used before operation and repeated after the cavity had been dry and healed for a year.

The author found that the hearing which remains is independent of the duration of the middle-ear suppuration, provided bone conduction is good. The findings at operation have no relationship to the final hearing except when cholesteatomata are present, when hearing tends to be poor. The most favorable operation cavity from the standpoint of hearing is the large dry cavity lined by a thin epithelium. The poorest is the mucous membrane type.

Of the author's patients, one-third had better hearing and two-thirds had poorer hearing one year after the operation. The result was somewhat dependent upon whether the ear was used or not. A new theory is needed to explain sound conduction in the absence

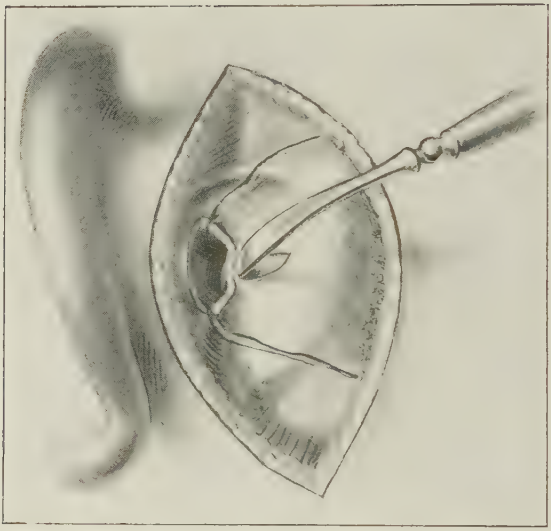
(7) J. Laryng. & Otol., March, 1926.

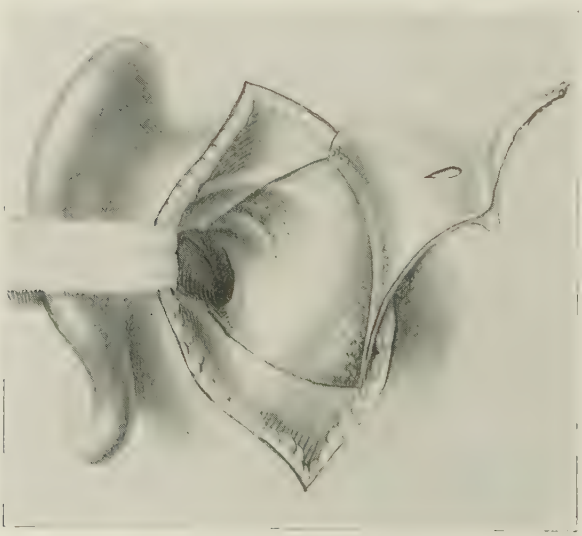
A



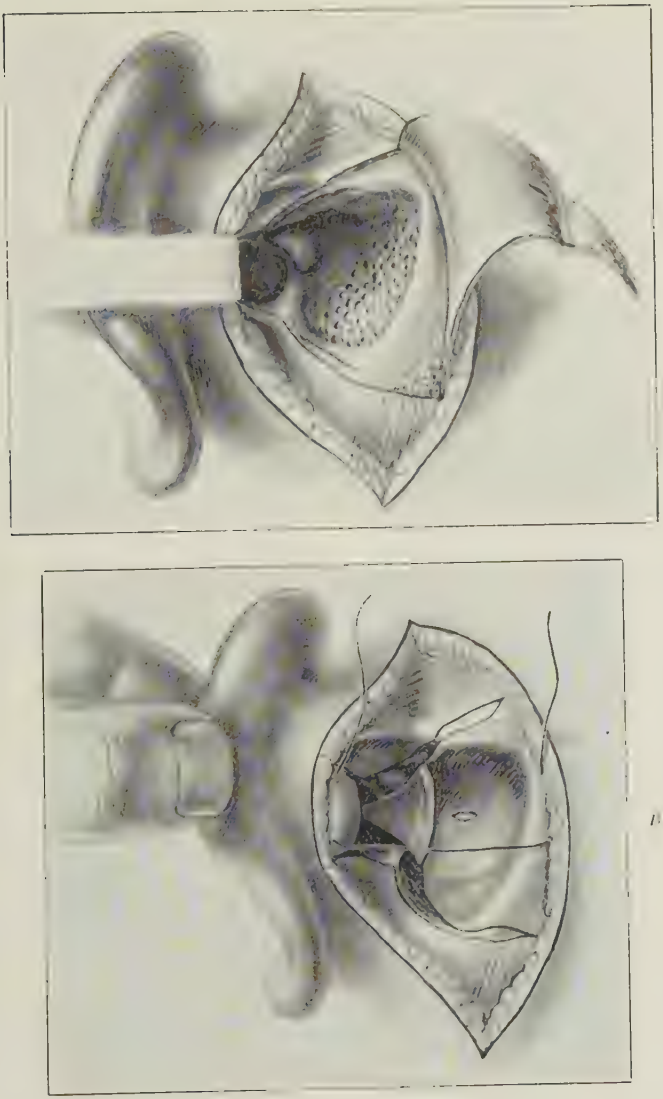
B

Illustrating the skin-periosteal flap for the radical mastoid.—Smyth, page 286.

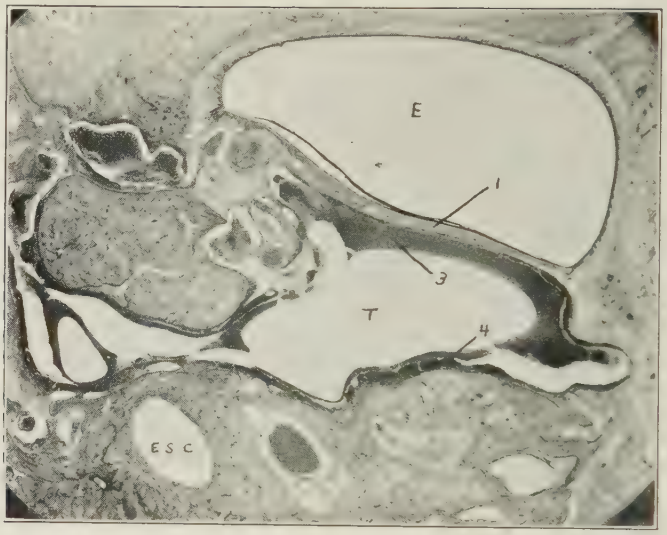




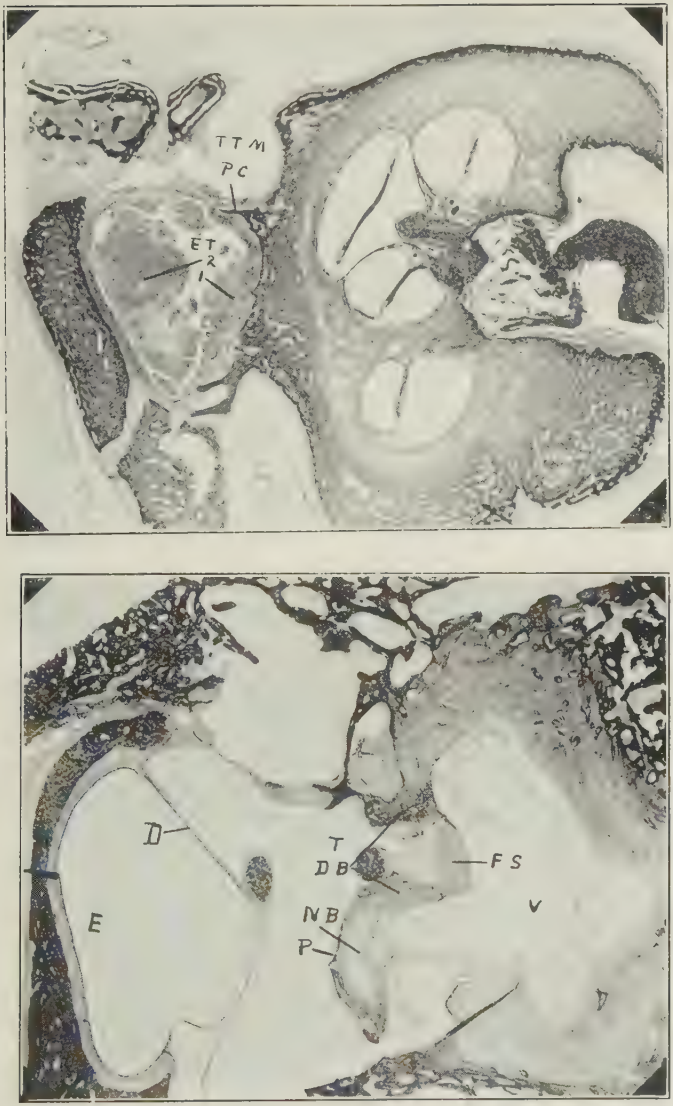
Illustrating the skin-periosteal flap for the radical mastoid.—Smyth, page 286.



Illustrating the skin-periosteal flap for the radical mastoid.—Smyth, page 286.

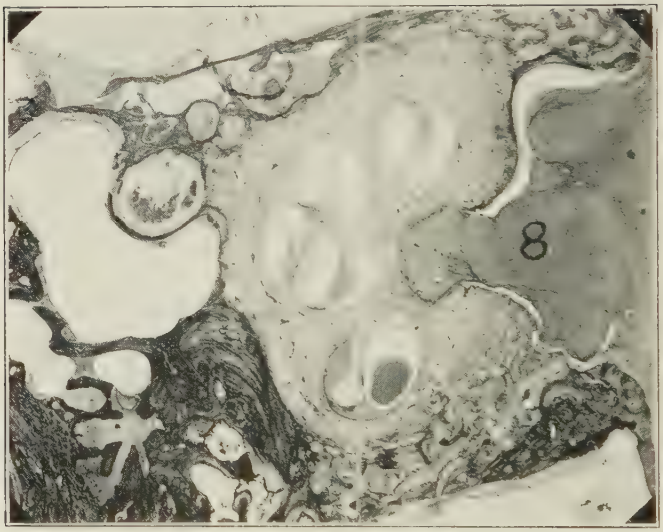


A.—Acute otitis media; E, external auditory canal; T, tympanic cavity; ESC, external semicircular canal; 1, drumhead; 3, purulent exudation; 4, thickened mucous membrane. *B.*—Cholesteatoma of middle ear: E, external auditory canal; SD, stumps of tympanic membrane; C, cholesteatoma; AT, annulus tympanicus; T, tympanic cavity; V, vestibule. Bridgett, page 289.



A.—Diphtheria of eustachian tube: TTM, compartment of tensor tympani muscle with greater part of muscle lost in preparation; ET, eustachian tube; 1, mucous membrane destroyed; 2, purulent exudation. *B*.—Otosclerosis: E, external auditory canal; D, drum membrane; T, tympanic cavity; DB, diseased bone around oval window; P, promontory; NB, normal bone; FS, footplate of stapes diseased; V, vestibule.—Bridgett, page 289.

PLATE XXIII.



Dural endothelioma of eighth nerve (8). Bridgett, page 289.

of the drum and ossicles after a radical mastoidectomy. According to Zimmermann's theory, which appears to be the most logical, sound waves reach the cochlea by way of the promontory, the basilar membrane being thus set in motion without the intermediary of the labyrinthine fluid. The ear is probably unique in its power of adaption, since after sound waves reach the cochlea by other ways, these unusual channels have developed so strikingly that the hearing is excellent.

[If hearing is to be secured or preserved, care must be taken during the radical mastoid operation to see that: (1) The relation of the stapes to the oval window must not be disturbed; (2) The promontory must not be curretted; (3) During the healing process, granulation tissue in the neighborhood of the middle ear must be kept down. When the internal ear is normal as indicated by normal bone conduction and the above rules are observed hearing for the standard whisper at three to ten feet should be expected.—Ed.]

Pathology of the Ear

Presentation of Microscopical Sections of Various Pathological Conditions of Ear. Having attended a course in Vienna on pathology of the ear, F. A. Bridgett[8] presents a series of slides showing the various conditions studied.

In sections showing *acute otitis media* the following changes are noted (*A*, Plate XXI):

1. The greatly increased thickening of the drumhead as a whole.
2. An increased thickening of the individual layers of the drumhead.
3. An enormous amount of purulent exudation in the tympanic cavity, with some fibrin present.
4. An increased thickening of the mucous membrane on the inner wall of the tympanic cavity.

(8) Laryngoscope, July, 1926.

5. Little or no purulent exudation in the semicircular canals.

Subacute and chronic inflammation of the middle ear, shows the following:

1. Very little swelling or infiltration of the drumhead as a whole is present.

2. The mucous membrane of the tympanic cavity shows a slight swelling with a moderate amount of cellular infiltration. The greatest changes take place on the inner wall of the tympanic cavity, especially in the niches of the oval and round windows. Here four layers are seen: (a) mucous mebrane; (b) fibrinous; (c) homogenous necrotic layer; and (d) pus layer.

Otitis media, meningitis (Influenza and Streptococcus Mucosus) demonstrates:

1. Thickening of drumhead.

2. Newly organized tissue practically obliterates the entire tympanic cavity.

3. The mucous membane of the tympanic cavity is greatly thickened, in some places to the extent of polyp formation.

4. Superiorly bone destruction has taken place but the periosteum is intact.

Epidermization of Margins of Perforation (chronic suppurative otitis media), shows:

1. Drumhead perforated with a loss of tissue. The epidermis of the modified skin layer of the drum has grown over the edge and into the tympanic cavity.

2. In the tip of the short side of what remains of the drum is seen a bony area, showing evidence of calcification and ossification as a result of a purulent process.

3. The mucous membrane of the tympanum is enormously thickened and polypous, with creases between the polyps, acting as retention recesses in a warm, moist, unaerated, undrained tissue, and extremely favorable to the growth of bacteria.

Several sections of *polyp* are presented, one showing

the true type lined by columnar epithelium. Calcification of the drumhead is shown, also with calcification on the promontory.

Cholesteatoma of the attic and also of the tympanic cavity (*B*, Plate XXI) is discussed by the author.

In a section of *suppuration of the antrum and mastoid*, these cavities are seen to be filled with a partially organized, partially purulent necrotic mass. Epidermis from the margin of the perforation of the drum has extended into the cellular exudate which totally occupies the tympanic cavity.

An unorganized mass of all types of leukocytes is seen in the lumen of the eustachian tube in a case of *diphtheria* (*A*, Pl. XXII). In the case of *scarlatina* there is a necrotic mass in the tube, outside of which are thick strands of fibrin containing leukocytes. An area of the lining epithelium is destroyed.

Chronic otitis media, with *fistula of the external semicircular canal and diffuse purulent labyrinthitis* shows a large perforation of the drumhead with a turning in of the edges. In the tympanic cavity is an organized mass of connective tissue and dense fibrous tissue, the former containing many leukocytes and capillaries. The bone on the antral side of the aqueductus fallopii is absent, as also is that an the antral side of the later semicircular canal. Purulent material has invaded the perilymphatic space through the fistulous opening, but the endolymph system is uninvaded.

A section of the *labyrinth suppuration* shows young connective tissue grown in and obliterating the scala tympani. New growth of bone has extended into the scala. Corti's organ is thinned out. *Atrophy of the labyrinth* shows a thinned-out tectorial membrane plastered down over the area normally occupied by Corti's organ, the latter being a crumbled mass lying on the basilar membrane. In another section there is evidence of suppuration in the scala tympani, media and vesti-

buli. Pus cells are found in the region of Corti's organ.

Several sections of *otosclerosis* (*B*, Pl. XXII) are presented. In this condition the normal bone stains bright red with hematoxylineosin, while the otosclerotic foci assume a reddish-blue hue. The normal bony capsule is absorbed, being replaced by the new, more spongy bone.

Tuberculosis of the ear is illustrated by sections showing: (1) tuberculosis of the tympanic cavity with perforation of the drumhead; (2) involvement of the tympanic cavity with partial necrosis of the head of the malleus; and (3) tubercular caries of the cochlea.

In conclusion sections are presented of *carcinoma* of the middle ear, *metastatic adenocarcinoma* of the eighth nerve and *dural endothelioma* of the eighth nerve (Plate XXIII).

Pathologic Studies of the Temporal Bone. J. Fischer[9] states that exostoses of inflammatory origin have incorrectly been classified with osteomas; they belong preferably to the category of acute and chronic periostitis. Osteomas occur in the external auditory canal, in the antrum, the mastoid process and the region of the lateral semicircular canal. A specimen is pictured with several circumcribed osteomas on the posterior surface of the pyramidal bone.

Many tumors of the temporal bone reported as sarcomas are in reality endotheliomas. This error has exaggerated the number of actual sarcomas. The malignancy of the tumor is recognized in the microscopic picture. Metastases are very rare.

The point of origin of carcinoma is usually the skin of the external canal or the auricula. In a few, the condition was found originating on the plastic flap of a mastoid on which a radical operation had been performed. The irritant factor in the etiology of a carcinoma is generally the chronic otorrhea. Epithelioma

(9) Monatschr. f. Ohrenh., 60: 137, 1926.

of the external canal develops rapidly and extensively but seldom metastasizes. Destruction of the neighboring bony structures is very marked due to pressure necrosis of the tumor, aided by the toxicity of the cancer cells.

The Rôle of Irradiation in Focal Infections and Obstructive Deafness. There is an area between the nasopharynx and the tympanic cavity where no surgical instrument can reach and no topical application can be made. Radiation, by reason of its unlimited degree of penetration and its action in dissolving obstructive lymphoid tissue, produces beneficial effects in chronic focal infections.

I. O. Denman[1] eliminates the focus of infection by means of roentgen rays. The dose given must be lower than the erythema dose so as to injure no other cells besides the lymphoblasts and lymphocytes. When the root cells are destroyed and the lymphoid tissue is no longer formed then absorption of the devitalized tissue by the blood stream begins. As the absorption goes on foci come nearer the surface and finally the walls of the foci are broken down and the infecting focus is open to the surface. The roentgen-ray treatment is not directly bactericidal, hence after removal of the lymphoid tissue by the roentgen treatment there is applied concentrated ultraviolet light upon the surface of the infected area.

Contribution to the Pathologic Anatomy and Pathogenesis of Deafmutism. The changes found in temporal bones of deafmutes do not differ generally in kind from residues of inflammations in nondeafmutes. Yet there are some peculiarities concerning the genesis, because labyrinth changes in deafmutes are bilateral. In later life unilateral inflammations of the labyrinth are caused by an acute or a chronic middle-ear suppuration, especially a choleatomatous suppuration; the inflammations of the labyrinth which develop in early

(1) J. Ophath. Otol. & Laryng., November, 1925.

youth bilaterally are more frequently the results of a specific or nonspecific meningitis. A smaller number of the inflammations of the labyrinth in early youth can also develop after necrotizing middle-ear inflammation in scarlet fever and measles. The more pronounced changes may be localized in the membranes of the windows and in the semicircular canals in tympanogenic labyrinthitis, and in the aquaeductus cochlearis and the cochlear nerve in meningogenic labyrinthitis. The pathologic anatomic changes caused by inflammatory processes in the labyrinth are known.

According to O. Steurer,[2] as the final stage of the lightest form of labyrinth inflammation, of serous labyrinthitis (labyrinth hydrops), degenerative changes of the epithelial covering of the endolymphatic spaces can be seen, especially atrophy of the stria vascularis and of Corti's organ. The latter may disappear entirely. These changes may frequently be connected with an enclosing growth of epithelium, with changes of the form and position of Corti's membrane and dilatation of Reissner's membrane (posthydropic degeneration of the neuro-epithelium [Wittmaack]). Such changes have been described previously by the author. In the sero-fibrinous and in the lighter form of suppurative inflammation of the labyrinth the exudate is changed into connective and finally into osseous tissue. In the final stages of this form of inflammation the perilymphatic spaces are filled, partly or completely, with more or less compact masses of connective tissue or bone (connective tissue or osseous obliteration of the labyrinth). In these cases the endolymphatic spaces show mostly degenerative changes as described before as posthydropic degeneration of the neuro-epithelium. Findings of this nature in temporal bones of deafmutes have been described in great numbers.

The grave forms of suppurative labyrinthitis and the

(2) Ztschr. f. Hals-, Nasen- u. Ohrenh., 11: 339, 1925.

necrotizing inflammations of the labyrinth which lead to a suppuration respectively necrotizing destruction of the soft parts of the labyrinth and frequently to lesion and destruction of the adjoining osseous capsule of the labyrinth, heal in the following manner. The whole inner ear is changed into a uniform firm mass of connective or osseous tissue. In contradistinction to the osseous obliteration of the labyrinth after fibrinous inflammation, the former cannot be discriminated against the surrounding old osseous structure of the labyrinthian capsule.

Contribution to Histology of Ototuberculosis. Fifty-four bones of 38 subjects with middle-ear tuberculosis were investigated by Oppikofer[3]. There were two types, granulating and necrosing. Caries of the ossicles was especially present in granulating tuberculosis. In patients who died from pulmonary tuberculosis, evidences of healing were present in the middle ear. In seven, the canal epidermis had grown into the middle ear and in one the aditus and antrum were entirely epidermized; 29 showed limitation of the process to the middle ear, 20 had inner ear involvement. There was one with acousticus tuberculosis associated with solitary tubercle of the cerebellum; the internal ear showed only congestion; the middle ear was normal.

The Internal Ear

Labyrinth Involvement in Trauma of the Head. A study has been made by H. Brunner[4] of 98 clinical cases, with microscopic examination of nine temporal bones from patients who either died after trauma to the head or who at some time suffered a trauma. In addition, twelve guinea-pigs have been subjected to experimental trauma under narcosis, and their temporal bone changes recorded with microscopic findings in the brain in four instances.

(3) Ztschr. f. Hals-, Nasen- u. Ohrenh., 12: 500, 1925.
(4) Monatschr. f. Ohrenh., 6: 697, 1925.

Stenger first attempted to analyze and to classify the pathologic changes of the inner ear after head trauma. The author divides head trauma into: (1) commotio cerebri; (2) commotio cerebri et auri internae; and (3) fractura capsuli labyrinthi. He summarizes the results of his investigation as follows:

1. Experimental production of commotio cerebri in guinea-pigs has disclosed degenerative changes in the nucleus of the cochlear and particularly of the vestibular nerve. These pathologic changes persist, and can still be observed when the examination is made a long time after the induced trauma. The changes in the brain are attributed partly to the direct action of the trauma on the brain tissue and partly to the circulatory disturbances.

2. About 43 per cent. of the cases of commotio cerebri show ear symptoms, consisting of a) true labyrinthine vertiga; (b) spontaneous nystagmus; (c) caloric hyperirritability; (d) tinnitus; e) normal cochlear findings.

3. The prognosis of commotio cerebri is disturbed by the occurrence of attacks of dizziness for many years.

4. Commotio cerebri can be proved some years after the trauma by the presence of caloric hyperirritability, or by the experimental production of a nystagmus on vigorously shaking the head.

5. The term commotio auris internae (Alexander) denotes all the symptoms and changes of the inner ear due to head trauma without fracture of the labyrinthine capsule. The pathology consists of (a) hypermia and perivascular exudate; (b) hemorrhage and exudation into endolymphatic and perilymphatic spaces; (c) free blood, blood pigment and connective tissue in the aquaeductus cochleae; (d) ecchymosis at the insertions of the membrane of the round window. The perception epithelium is apparently unaffected.

6. The subjective disturbances from a trauma are

due to concussion of the lymphatic fluids and disturbances of the circulation. The symptoms due to the concussion disappear shortly, but the circulatory disturbances (the 'otitis interna vasomotoria''), persist as the responsible feature for the commotio auris internae.

7. The ''otitis interna vasomotoria'' affects either the perilymph alone, or the perilymph and endolymph. In the former instance a deafness of the sound conducting apparatus occurs, while in the latter, besides deafness there are spontaneous labyrinthine symptoms, abnormal caloric reactions with perhaps normal after-turning nystagmus.

8. Marked vertigo and nystagmus sometimes occur suddenly after a head trauma if the patient assumes a certain position.

9. If, after trauma, sound conducting and sound perceiving deafness (middle and inner ear) result, much improvement in the hearing cannot be expected. If only middle ear deafness results, the prognosis for improvement of the hearing is good, especially in young and healthy patients.

10. The inner ear changes found in a patient dying from head trauma cannot be taken as the pathologic picture of commotio auris internae in the patient who outlives the trauma.

11. Transverse fracture through the petrous bone passes through the labyrinthine capsule and is usually fatal. Should the patient live, total permanent deafness results with no reaction on caloric stimulation; however, vestiges of labyrinthine function may in some cases be elicited, and then the differential diagnosis between fracture and severe commotio cannot definitely be settled.

Neuritis and Labyrinthian Carcinomatosis. The otologic examination of patients suffering from malignant tumors of various localizations show that decrease in function of the hearing organ occurs especially in

carcinomas and in sarcomas. The symptoms consist of progressive hardness of hearing, which begins with a shortening of the time of the perception for low tones and labyrinthian hypo-irritability in the beginning, concerning caloric minimal irritation. Both are mostly of a reversible nature.

T. D. Demetriades[5] has studied eight cases where the carcinomatosis has affected the inner ear yet not actually invading it. His results show the following:

1. In malignant tumors which are far from the ear, or near the same, and in those which grow secondarily into the ear, the toxic effect of the tumor is the cause of the decrease in function. This is also the case in primary and in metastatic tumors of the hearing organ, so long as the labyrinth is not infiltrated by the tumor. Yet, in cases with direct destruction by infiltration and pressure, the toxic component seems to be of importance.

2. The process in the ear is the consequence of a primary toxic lesion of the whole vessel system of the ear, and of the central portion of the acoustic nerve. This is followed by a toxic lesion of the nerve elements.

3. At the periphery, which seems to be the essential place of the clinical symptoms, the process begins, aside from the neuritis, with a labyrinthopathia exsudativa carcinomatosa (labyrinthitis). The middle ear plays a minor part with the exception of the tumors in the epipharynx.

4. The degenerative atrophy of the central and peripheral portion of the acoustic nerve must be considered partly as the end-results of these processes.

5. Two stages must be differentiated. The first stage is of a reversible nature. The second stage can scarcely be influenced by removal of the tumor. This stage corresponds with the time when a decrease of the turning, and sometimes also of the galvanic reac-

(5) Ztschr. f. Hals-, Nasen- u. Ohrenh., 11: 502, 1925.

tion, is present, besides a pronounced decrease of the time of perception of tunes (also of the higher tunes) and of the acuity of hearing.

6. A homolaterality exists, as all symptoms and pathologic histologic findings are more pronounced on the ear next to the tumor, compared with the other ear, if no other disease was preceding.

The Nature of Nystagmus. E. R. Lewis[6] believes that nystagmus is a physiologic motor phenomenon. This phenomenon may be normally elicited by ocular stimulation or by aural stimulation, or by both.

In either event the resulting eye movements consist of two phases: a slow pull in one direction, followed by a quick jerk in the opposite direction. The direction and plane of these eye movements are determined in accordance with certain definite coordination "patterns."

Movements to which the head is subjected call into circuit the same "pattern," with the result that eye reaction movements, whether from visual or aural initiation, are identical in direction, in plane and in phase.

"Railroad nystagmus" is identical with "vestibular nystagmus during rotation." This identity seems to constitute a very pertinent indication that the vestibular mechanism comprises the elements of a special sense apparatus no less worthy of the name "special sense" than that of the ocular mechanism.

Ablation Experiments on the Labyrinth of Frogs. J. Tait* has found that destruction of the saccular macula produces no demonstrable effect on the animal's equilibrium, whereas destruction of the utricular macula deprives it of all sense of its relation to gravity, proving this portion of the labyrinth to be a strictly static organ concerned with change in position about a horizontal axis. This point was illustrated by frogs in

(6) Ann. Otol. Rhinol. & Laryng., June, 1926.
(*) Trans. Amer. Laryngol., Rhinol., and Otol. Soc., May, 1926.

which the utricular macula had been destroyed, in comparison with normal frogs.

The semicircular canals, on the other hand, are concerned with active motion of the head in the various planes in which they lie. These are divided into horizontal and vertical, the latter being so placed that each canal points toward one of the four limbs. Rotation of a normal animal about a horizontal axis results in supportive limb movements in the opposite direction, a reaction which is absent if both horizontal canals are destroyed. If one remains, the reaction takes place or not according to the direction of rotation. In a normal animal rotation in the plane of any one of the four vertical canals results in a supportive movement of the corresponding limb, an effect which does not occur if the canal relating to this limb is destroyed. Thus, rotation toward the right posterior canal normally produces an extension of the right hind leg, toward the left anterior canal, of the left fore leg, and so forth, effects absent following destruction of these canals.

The author thinks that these results might be usefully applied clinically in testing equilibrium of patients, and suggests a tilting board with which, with patient on hands and knees, the individual vertical canals could be quickly stimulated and the effect on each of the four limbs noted.

Miscellaneous Conditions

The Occurrence of Otosclerosis in the Etiology of Progressive Deafness. The importance of correct diagnosis in otosclerosis is emphasized by G. S. Shambaugh and J. W. Holderman[7]. This question is all the more pertinent because we have as yet no method for diagnosing otosclerosis from functional tests alone. When the spongifying of the labyrinth capsule develops in the region of the oval window, the first evi-

(7) Arch. Otolaryng, August, 1926.

dences that appear of a defect in hearing are those resulting from rigidity of the stapes. These symptoms are identical with those resulting from other pathologic processes producing rigidity in the sound conducting mechanism. On the other hand, spongifying of the labyrinth capsule may develop at a distance from the oval window when the symptoms produced are those of nerve deafness. Nerve deafness develops sooner or later in all cases of otosclerosis, but in the primary fixation of the stapes they are, in the beginning at least, relatively unimportant when compared with those produced by the stapes rigidity. The diagnosis of otosclerosis has, therefore, to concern itself, on the one hand, with the differentiation of primary fixation of the stapes due to changes in the osseous labyrinth from other conditions producing fixation of the conducting mechanism, and, on the other hand, with the diagnosis of primary nerve deafness associated with spongifying of the bony capsule from other conditions producing nerve degeneration.

Of these two clinical types of otosclerosis, one causing primary fixation of the stapes and the other producing primary nerve degeneration, the former offers less difficulty in diagnosis, and from the postmortem examinations that have been made appears to be the much more frequent type. "When the functional tests give the Bezold triad (elevation of the lower tone limit, prolonged bone conduction and a negative Rinne reaction) reactions characteristic of an obstruction in sound conduction, and when in addition, the examination excludes the presence of a tubo-tympanic process, that is, when the tube is found patulent and the drum membrane normal, the diagnosis of primary fixation of the stapes, the result of spongifying of the labyrinth capsule, seems assured." It is significant that not a single case has been reported in which necropsy has failed to verify otosclerosis with fixation of the stapes

when the foregoing clinical observations have previously been noted.

In the second type of otosclerosis, that in which the spongifying process develops at a distance from the oval window and in which the stapes remain movable, the functional condition may be typically those of primary nerve deafness. This type is less frequently recognized and apparently occurs less frequently than that producing primary fixation of the stapes. That the spongifying of the labyrinth capsule could be the responsible etiologic factor when the functional conditions were those of primary nerve deafness has been verified by necropsy. More extensive necropsy study of cases of primary nerve deafness, especially those in which the deafness begins in early adult life, may show that otosclerosis is more frequently the cause than we now suspect.

From their studies the authors have found that:

1. Of a total of 113 cases diagnosed as otosclerosis, in 92 the drum membrane was quite normal. In 15 there was a distinct pinkish glow from the promontory. Twenty-one patients showed some alterations in the membrana tympani. In 105 the functional tests demonstrated fixation deafness. In eight patients the functional reactions were those of primary nerve deafness. Paracousis Willisi was recorded in 64 patients. Complaints of vertigo were obtained in 6 patients.

2. The clinical recognition of this pathologic entity is limited for the most part to those cases in which the process is a primary lesion, that is, to those in which it is not preceded by any tangible evidences of a previous tubotympanic inflammation.

3. The type of otosclerosis usually diagnosable clinically is the type which causes fixation of the stapes and in which no evidences of previous tubotympanic trouble exists.

4. The recognition of otosclerosis as the cause for stapes fixation can often be made even when tangible

alterations exist in the drum membrane indicative of an old tubotympanic process, since the two usually do not run the same clinical course.

5. Otosclerosis develops also with the symptoms typical of nerve deafness, that is, in cases in which stapes fixation is absent. The diagnosis of this type is obviously more difficult.

6. It seems not unlikely that because of this difficulty in making a diagnosis, further necropsy observations may prove that spongifying of the labyrinth capsule in the absence of stapes fixation may be responsible for the occurrence of primary nerve deafness more frequently than we now suspect.

7. An associated degeneration of the nerve, as evidenced by the defect at the upper end of the tone scale, develops more and more as otosclerosis producing stapes fixation progresses.

8. Otosclerosis without fixation of the stapes, beginning with the symptoms typical of nerve deafness, may as time goes on develop stapes fixation with the typical Bezold triad superimposed on the previously existing nerve deafness.

9. A pinkish glow from the promontory is pathognomonic of otosclerosis.

10. The symptom of paracousis Willisi is rarely found except in cases of otosclerosis with stapes fixation.

11. Skiagraphy of the mastoid does not appear to be of any particular assistance in fixing the diagnosis of otosclerosis. Normal pneumatization can be anticipated when all evidences of a previous tubotympanic process gathered from examination of the drum membrane are absent. Arrested pneumatization has the same significance as palpable alterations in the drum membrane. Both are indicative of an earlier inflammatory middle-ear disease. The presence of arrested pneumatization, just as the existence of alterations in the drum membrane, can hardly be expected to inter-

fere with the subsequent development of the spongifying of the labyrinth capsule.

The authors conclude as follows:

Otosclerosis is the most frequent cause for those cases of progressive deafness which result in a more or less severe handicap. The pathologic changes in the ear that cause the impairment of hearing are always in the nature of fixed or degenerative changes which cannot be altered by any form of treatment, local or general. Patients suffering from otosclerosis are the frequent victims of ruthless exploitation at the hands of medical quacks. Such exploitation has increased greatly in recent years and the extent to which it has proceeded, promoted by widely distributed bulletins and often by misleading articles in the lay press, may be surmised from the variety of bizarre forms of local treatment with which these unfortunates are constantly being pursued by men who cultivate the faculty of salesmanship in place of professional skill and common honesty.

This exploitation takes the form of treatment by attenuated irradiation of the pituitary body, local applications and manipulations by way of the eustachian tube, and the so-called "finger surgery" in the nasopharynx all equally useless. Elaborate and expensive electrical devices are constructed for the purpose of restoring, by the prolonged application of loud sounds, the function of a conducting mechanism out of commission because of bony ankylosis, and of a nervous mechanism that has undergone degenerative changes. Another "cure," widely advertised both through special bulletins and by articles in the daily papers, consists of an effort to commercialize the phenomenon of paracousis Willisi. A rather elaborate electrical apparatus is devised for producing vibrations below the threshold of hearing in order to develop the phenomenon of paracousis Willisi so common in otosclerotic patients, and the hope is held out that by the pro-

longed and repeated application of these vibrations a permanent improvement in the hearing will result.

The first method, that of prolonged bombardment of the ear with very loud sounds, ignores a long established fact, that this is one of the surest methods of producing degeneration in the cochlea. The second, the attempt to improve the hearing permanently by stimulating the symptoms of parcousis Willisi, overlooks the fact that otosclerotic patients whose occupations subject them continually to surroundings that develop paracousis Willisi proceed, nevertheless, exactly as do all these patients, with the progressive loss of hearing.

It may be expecting too much of manufacturers to look to them to seek cooperation and approval from scientific otologists before elaborating expensive devices, the only result from which is the victimizing of people handicapped by incurable deafness. We should endeavor to develop among the general medical profession a better appreciation of the fundamental facts regarding otosclerosis in order to gain their cooperation in the obligation that is ours of protecting so far as may be possible the victims of this form of incurable deafness from the ruthless exploitation of medical quacks.

Instruments devised as aids for hearing do not come under the type we are here criticizing. The solution of the clinical problems of otosclerosis lies along the further perfection of instruments of this type, and the prevention of the development of spongifying by a better knowledge of the factors underlying its cause.

Otoclerosis. In the first section of this article D. W. Drury* discusses the various causal factors of this condition as reported in the literature. The pathology, the usual diagnosis and treatment are also considered.

The author offers as a suggestive etiologic factor the assumption that otosclerosis begins about the time of

(*) Ann. Otol. Rhinol. & Laryng., September, 1926.

puberty. Youth is the plastic age. During this period the cells that are on their way toward specialization may, if conditions become altered, especially in a predisposed person, dedifferentiate, becoming thereby embryonal again; and then they start off on a new line of differentiation. For example, an individual with the correct determinants, through a chemical change in the body, possibly controlled in activity by the endocrine glands, passes towards puberty, then the embryonic cells again appear, influenced possibly by the persisting embryonic cells remaining in the labyrinthine capsule. This later process can be called regeneration. Botanically, if, in mowing, a young ragweed is decapitated, its parenchymal cells dedifferentiate into meristematic cells again, and these set about forming a new top by redifferentiation into all the types of cells normally occurring therein. Zoologically, the egg of a frog normally divides into two cells, each of which respectively gives rise to different tissues of the adult amphibian. But if these two blastomeres are shaken apart each will give rise to a distinct frog: for the cells are still in their period of juvenescence and have the ability to return to their original state and start development over again along new lines. Now, if the same individual had been a little older, dedifferentiation, and hence regeneration, would have been impossible, in spite of the determinants, for maturity would have already set in.

In the second part of the article the author stresses the possible relation of the endocrine system to otosclerosis. He reviews the literature as regards the thyroid and parathyroid glands, the pituitary and the ovaries. As illustrations of the above connection the cases of two brothers are reported. These two boys are felt by the author to illustrate the general thesis of the etiologic background of otosclerosis. In one there is no evidence of an endocrine factor but in the other there are many observations conforming to the estab-

lished indices of a pituitary disturbance. The author concludes the following:

1. It would seem to be established that many and widely divergent factors can excite the appearance of otosclerosis in a predisposed person.

2. The essential factors underlying the morbid change is possibly a chemical one affecting the nutritive stability of developing and fully developed bone and cartilage.

3. In a dominant percentage of cases the several endocrine glands are direct etiologic factors through their influence on normal metabolism.

4. In cases of otosclerosis without firm ankylosis of the footplate of the stapes or other irreversible organic changes, a response to the proper glandular treatment may be expected with reasonable confidence.

5. The constitutional tendency or hereditary influence would seem to be a dominant factor in determining the condition of otosclerosis where an endocrine or nonendocrine pathology produces disturbances of metabolism.

6. That the work so far done is to be regarded as suggestive rather than definitive of a possible ultimate solution of the highly complex problem of the etiology of otosclerosis.

Is a Differential Diagnosis Between Middle and Internal Ear Deafness Possible? A. G. Pohlman and F. W. Kranz[8] have examined seven individuals. They have plotted records of tests made on these patients, showing a comparison of bone sensitivity (made with the bone activating telephone on the forehead) and air sensitivity (made with the continuous scale audiometer).

From the results of the experiments the authors regard their evidence as substantiating their previous statement that both air and bone transmitted sounds normally enter the cochlea through the stapedial foot-

(8) Laryngoscope, April, 1926.

plate. On the basis of this and other experimental work done at the Riverbank Laboratories, they are inclined to doubt whether it is possible, at the present time and with the present methods, to definitely differentiate a perception from a conduction deafness. When the knowledge of the acoustical system has advanced sufficiently, it may be possible to establish exactly where an interference is located in the sound transmission apparatus and a technic may then be developed to adapt the individual to his defect. It may also come to pass that many cases which have been classed as perception deafness or nerve lesion may be benefitted through operative procedure.

It may be pointed out that the present experiment serves as an example of the researches made possible by the use of the continuous scale audiometer, yielding information which an audiometer of discreet frequency intervals would never have furnished.

[The question of the relation between the oval window and the round window in the hearing function has agitated the minds of otologists and physiologists for many years. Whatever may be the relation in the normal ear and in nonsuppurative deafness, it is comparatively easy to determine the relation in patients who have had the membrane removed as in the condition following the radical mastoid operation. A vaseline covered pencil of cotton, placed against the round window, has been found to interfere more with the perception of sound waves coming through the air than when placed against the oval window.—Ed.]

Otogenic Paralysis of the Abducens, With Especial Mention of Isolated Palsy Associated With Irritation of the Gasserian Ganglion. W. H. Sears[9] believes that:

1. Isolated paralysis of the abducens associated with irritation of the Gasserian ganglion is a relatively rare complication of acute suppurative otitis media, though less rare than is apparent, for many cases have

(9) Ann. Otol. Rhinol. & Laryng., June, 1926.

appeared in the literature under other titles, others are seen and diagnosed, but not recorded, while some are met and not recognized.

2. Pain of Gasserian type is commonly associated with otogenic paralysis of the abducens, so that the Gradenigo triad of symptoms will be present as a rule in any such palsy.

3. Many cases reported under the Gradenigo syndrome are classified incorrectly from an etiologic basis.

4. The thorough study of the infecting organism in any acute otitis, routinely culturing and typing the same, may give indication for operative interference before a palsy occurs, and lessen the mortality following its occurrence.

5. The subject is of sufficient importance to be thoroughly incorporated in every textbook on otology.

6. The mortality of 18 per cent. indicates a graver prognosis than has been associated.

The author suggests the following hypotheses:

1. The great variations in size of Dorello's canal as a factor in the occurrence of or the escape from paralysis of the abducens.

2. The asymmetry in size of Dorello's canal on the two sides of the same patient as influencing the occurence of a contralateral palsy.

3. The development of increased resistance of the nerve on the side of the affected ear in thrombophlebitis or thrombosis of the associated sinus as aiding in determining a contralateral sixth paresis.

4. Anomalous variations in distribution of branches of the basilar artery in relation to the abducentes as influencing compression in meningitis serosa, or cerebral edema, in the production of sixth nerve paralysis of the opposite side. (a) Artery superficial to the nerve on one side, nerve superficial to the artery on the other side; (b) artery superficial to the nerve on one side, nerve free from arterial relation on the other side; (c)

artery superficial to the nerve on one side, artery piercing the nerve on the other side.

The writer discusses the subject exhaustively from the standpoint of anatomy, etiology, and symptomatology. The literature is thoroughly reviewed and 172 cases from 126 authors are analyzed.

Surgical Treatment of Facial Paralysis. In a discussion of facial paralysis A. W. Adson[1] states that paralysis of the seventh cranial, or facial nerve, caused by either disease or injury, is more common than paralysis of any other cranial or spinal nerve, and since facial paralysis produces asymmetry of the face, inability to close the eye, lacrimation, difficulty in mastication and deglutition, and loss of expression, it presents a serious problem to the otologist, the neurologist and the neurologic surgeon. The prognosis depends on the site and type of injury. Some lesions heal spontaneously, others need surgical intervention.

The most common type of facial paralysis, Bell's palsy, is in all probability a simple neuritis, and is commonly supposed to be due to exposure to cold. Ney believes that the lesion is situated in the vertical section of the facial canal, since the chorda tympani usually escapes involvement. In cases with involvement of the chorda tympani, it is rare, he believes, for the lesion to extend sufficiently high in the canal to produce paralysis of the stapedius muscle, and he uses this argument in recommending an anastomosis of the facial nerve in the canal when the nerve does not regenerate following Bell's palsy. The lesion itself is of a compressive nature, most likely due to inflammation and edema of the nerve, and heals spontaneously if the inflammation subsides without too much cicatrization and constriction.

Facial paralysis associated with acute or chronic otitis media is more common in children than in adults, but, according to Jones, is rare as compared with the

(1) Arch. Otolaryng., September, 1925.

otitis media of childhood. When it does occur it is brought about either by direct involvement of the nerve or by the pressure of exudate within the fallopian aqueduct, or by pressure from the tympanum. Caries of the wall may take place even in the acute stage. At necropsy the facial nerve has sometimes been found lying free in the tympanic cavity surrounded by pus, when there was no evidence of facial paralysis prior to death. From this he concludes that it is reasonable to infer that there must be pressure on the nerve within the narrow bony canal before facial paralysis is produced. Many cases of facial paralysis following acute mastoiditis have been reported in which there was subsequent improvement following a radical mastoid operation. Wallerstein's report of a typical case illustrates this. The patient gave a history of acute otitis media which had ruptured spontaneously; five days after the onset facial paralysis began and became complete in two days. Following a radical mastoid operation there was immediate improvement, and in three days there was evidence of marked improvement. In this particular case there was no evidence of necrosis or dehiscence of the facial canal in spite of the facial paralysis, but Wallerstein believes that facial paralysis is more likely to occur when a dehiscence of the canal exists.

It is not uncommon for partial or complete facial paralysis to develop several days after a radical mastoid operation; this may be due to neuritis or edema of the facial nerve, or to a dehiscence of the facial canal which has permitted an extension of the infection into the facial canal; the latter usually subsides with recovery from the paralysis and subsidence of the mastoid disease. If the paralysis occurs immediately after the operation, it may be due to hemorrhage within the canal or to pressure or traction; only occasionally is it due to a complete severance of the nerve.

With the physiologic interruption of the facial nerve there may be a lack of volitional movement of the facial muscle; when this is restored by faradic stimulation, recovery will probably take place in from six to twelve weeks, but failure of the faradic impulses to produce a response after a period of from three to six weeks, shows that degeneration has set in. If the lesion producing the paralysis is due to edema or inflammation, spontaneous regeneration may take place, and evidence of recovery should manifest itself in from three to six months after the onset of the paralysis. Cases have been known in which regeneration has resulted as long as a year after the onset of the paralysis; owing, probably to slow recovery of the inflammatory lesion in the canal. When an injury of inflammatory origin to the nerve results in marked fibrosis and constriction, recovery rarely occurs, and surgical intervention becomes necessary, as in complete interruption of the facial nerve from trauma.

It is well to wait a reasonable length of time for spontaneous recovery before anastomosing nerves. The surgeon should not be misled by the occasional deforming contraction on the paralyzed side, but should rely on the electrical reactions of degeneration and regeneration, bearing in mind that the faradic current should be employed in testing for them. The galvanic current will produce a myotatic reaction in a paralyzed muscle for some time after a nerve injury. Galvanic reaction is important, since little is to be expected from operation on a nerve if the muscles have become fibrotic and fail to respond. During the period of paralysis, it is well to prevent overstretching of the muscles by devices such as colored adhesive plaster to the cheek, or a hook applied to the angle of the mouth and supported from the side of the head. Unless there is evidence of complete severance of the facial nerve, from the history of the injury, it is well to postpone nerve anastomosis for a period of six months. If there is suggestive

evidence of regeneration, in the form of recovery of muscular tone at the end of six months, it is well to defer surgical interference for from three to six months longer. The same principles affecting nerve anastomosis in general, affect nerve anastomosis of the facial nerve, that is, the sooner the anastomosis is performed after the injury the better will be the result, bearing in mind, however, that the nerve should be given an opportunity for spontaneous recovery; if this does not occur within from six to nine months, it is very doubtful whether such regeneration will ever take place.

It is known that a good physiological result will follow if the anastomosis is performed during the first six or twelve months after the injury, but that the degree of recovery diminishes progressively if operation is postponed beyond twelve months until after a period of three years, and very little healing may be expected. This is explained on the ground that fibrosis takes place in the peripheral segment and does not permit the entrance of new neurofibrillae. It is also known that the ideal anastomosis requires careful dissection, absolute control of hemostasis, and accurate apposition of the freshened ends of the nerve, with previous removal of any scar tissue or redundant fascia, and suture with fine silk (No. 00) in the epineurium, without tension on the ends of the nerve sutured. When recovery takes place spontaneously following complete degeneration of the facial nerve, it is not uncommon to find that the central nerve fibers have failed to follow the old pathway but that fibers have crossed so that the axon that previously innervated the orbicularis oris may now innervate the orbicularis palpebrarum, and in attempting to smile, the lids of the eye may close, or in attempting to close the eyelid the patient may grin.

If the hypoglossal or the spinal accessory nerve is anastomosed, improvement of muscular tone is the first sign of recovery; it reduces the flaccidity, or flabbi-

ness, of the cheek; this may appear in from three to five months. Voluntary control of the buccinator and of the orbicularis oris is the next manifestation of improvement, then voluntary control of the other muscles of the face, and finally of the frontalis portion of the occipitofrontalis and of the depressor anguli of the lip.

When the eleventh or twelfth nerve is employed in the anastomosis, associated movements of the shoulder or tongue produce contraction of the facial muscles, and it is not until the cortical centers have become reeducated that the patient is able to produce symmetrical movements or to express emotion In view of the incoordinate movements of the face, the associated movements of the face with the shoulder in the spinofacial, and the associated movements of the tongue in the faciohypoglossal anastomosis, the surgeon desires, if possible, to anatomose the severed ends of the facial nerve. When compelled to employ an adjacent nerve, he must first consider the disadvantages of sacrificing the nerve employed, and then compare the results of regeneration with the possibility of reeducation; plastic operation on the muscle should not be employed unless it is impossible to get results from nerve anastomosis, when, for example, there is an injury across the face, making anastomosis of the peripheral branches on the cheek or eyebrow impossible, or when paralysis has been of such long standing that nerve regeneration will not take place.

From this review of the literature, it is evident that the spinofacial or the faciohypoglossal anastomosis does not offer all that is hoped for in the restoration of facial control. It is true that regeneration takes place, that facial tone returns, and that voluntary movements can again be performed, but it is also true that the patient has difficulty in expressing emotion on the side that was paralyzed and the dissociation movements of the face occur when the shoulder or the tongue is moved. The most ideal anastomosis is the repair of

the facial nerve, that is, end-to-end anastomosis of the proximal and distal ends of the facial nerve, but even with this operation recovery is not always perfect, since spontaneous regeneration following lesions similar to Bell's palsy may result in crossed innervation. Plastic operations should be resorted to when a nerve anastomosis is inadvisable or impossible.

Adson's experience with spinofacial anastomosis has shown that regeneration is very satisfactory, and that in some cases there is evidence of emotional control.

With reference to the disadvantages of the paralysis of the trapezius and sternocleidomastoid muscles, there is considerable atrophy, it is true, and at first some tenderness and pain; however, as the patient's convalescence progresses, there is little complaint of discomfort. It must also be borne in mind that a spinal accessory injury is a very common occurrence in a complete dissection of the posterior triangles for tuberculous glands, and that the sternocleidomastoid muscle is frequently sacrificed with a complete dissection of the neck for malignant glands; aside from their atrophy or absence, the patient rarely complains of any discomfort or lack of function. So far as the functional results are concerned, the patient is well able to carry on all of his regular activities. Should the patient be a girl and desirous of wearing low cut dresses, there would be a decided disadvantage, but in the case of a man, the atrophy is very readily covered. On the other hand, it is quite difficult to cover the tongue at all times to avoid showing the atrophy. Certainly, the inconvenience in chewing, swallowing, and speech is no greater than the inconvenience in the trapezius and sternocleidomastoid muscles.

So far as the completeness of regeneration is concerned, it is difficult to state which procedure is the more effective. Adson believes that the results are about equally good, but has employed the spinofacial method because of the discomfort and the exaggerated

associated movements that occur during the regenerative period which are apparently worse after faciohypoglossal anastomosis, since the patient uses the tongue more frequently than the shoulder. Surgeons who advocate faciohypoglossal anastomosis frequently insinuate that it is embarrassing for a young lady to carry a parasol while strolling because of the associated movements between the shoulder and the face, suggesting flirtation with passers-by, but this can be avoided if she will but carry the parasol in her other hand. In advocating faciohypoglossal anastomosis, one should not forget that it is perhaps much more embarrassing, following this procedure, to make grimaces and wink constantly when speaking to friends or eating in their presence. Following a spinofacial anastomosis, one can gently shrug the shoulder to produce the associated smile when desired.

The arguments on both sides have been overdrawn, perhaps, but it is obvious that both spinofacial and faciohypoglossal anastomoses are justified if it is impossible to anastomose the severed ends of the facial nerve; the latter procedure should be performed, of course, when possible (Cushing). The degree of improvement is probably equally good in spinofacial and in faciohypoglossal anastomoses. Paralysis of the tongue may be avoided in the faciohypoglossal anastomosis by transference and suture of the descendens hypoglossi to the distal end of the hypoglossal, as suggested by Ballance. Atrophy of the sternocleidomastoid and the trapezius muscles in the spinofacial anastomosis may be avoided by anastomosis of the descendens noni into the distal end of the spinal accessory, as suggested by Grant.

End-to-end suture with complete division of the nerve is perhaps more satisfactory than the employment of only half of the nerve, as it is more difficult to dissociate the movements of the facial nerve from those of the spinal accessory or the hypoglossal as the nerve

regenerates. Taylor has, it is true, obtained some very good results by implanting the distal end of the facial nerve into a slit in the hypoglossal nerve, and Ballance has obtained satisfactory results from end-to-side anastomosis. The results obtained in the two latter instances must have been due to the cutting of axons during the process of grafting which, as they regenerated, entered the distal segment of the facial nerve. End-to-end anastomosis with fine sutures of silk in the epineurium, without tension, is the accepted type of anastomosis.

Otologic Complications of Basal Skull Fracture. According to C. F. Yerger,[2] the otologic aids in the diagnosis of basal skull fractures are:

1. Profuse bleeding from the ear.

The duration of the hemorrhage from the ear is usually short; ordinarily, it ceases on the first or second day, and it may be first noticed as a blood clot in the external canal and in the torn membrana tympani. Brun mentions a case of profuse hemorrhage from the ear in anemia. Usually the hemorrhage stops completely, and all discharge is absent or only a slight serous secretion is left. The source of the hemorrhage may be from the bony external auditory canal, membrana tympani, mucosa of the tympanic cavity, diploetic veins of the fractured bone and the meningeal vessels. Buck called attention to the occurrence of a copious and protracted hemorrhage from the tympanic artery following simple fracture of the glaserian fissure.

It is necessary to exclude the entrance of blood into the canal from some external source. A rupture of the membrana tympani or a fracture of the external auditory canal may be unassociated with basal skull fracture. In a simple fracture of the bony external auditory meatus due to blow on the face or chin, the line of fracture is in the anteroinferior portion, and extends

(2) Arch. Otolaryng., July, 1926.

inward to involve the anterior part of the membrana tympani.

2. The escape of cerebrospinal fluid from the ear. This is less common than bleeding from the ear. The amount of the discharge is greater than that of blood, and is of longer duration. It always signifies a basal skull fracture involving the temporal bone, and is present in 20 per cent. of the basal skull fractures. It is a pathognomonic sign that the subarachnoid space has been opened. This usually occurs over the tegmen or in the sheaths of the seventh and eighth cranial nerves in the internal auditory meatus. The quantity of the cerebrospinal fluid that escapes may be as high as 600 c.c. in twenty-four hours. It usually escapes through a laceration in the membrana tympani, or, if this is intact through a fissure in the bony external meatus. Blood and cerebrospinal fluid may escape simultaneously.

3. The presence of brain substance in the external auditory canal. This is positive evidence of a basal skull fracture involving the temporal bone.

4. Fracture of the posterior superior wall of the bony external auditory canal with rupture of the posterior superior quadrant of the membrana tympani. Luxation or fracture of the ossicles may be present. There may be lesion of the soft parts adjacent to Schrapnell's membrane.

5. Subcutaneous emphysema over the mastoid region. This is indicative of a fracture involving the mastoid cells which communicates with the subcutaneous tissues.

6. Peripheral facial paralysis. This is located on the side of the injured nerve. If deafness is present, it is on the same side as the deafness. When the chorda tympani nerve is involved, there is loss of taste on the anterior two-thirds of the tongue on the side of the facial paralysis.

7. Disturbances of the auditory apparatus. The

peripheral portion of the cochlear nerve with its end-organ, Corti's organ, located in the membranous portion of the cochlear is affected in the vast majority of cases. The central portion of the cochlear nerve with its auditory tract in the midbrain and cerebrum and the auditory center in the temporal lobe is rarely involved.

Often it is impossible to make the functional hearing tests immediately following the injury on account of the coincident stupor or unconsciousness of the patient. The examination should not be attempted until the patient has recovered from shock or clouding of the sensorium, so as to be able to cooperate intelligently with the examiner.

8. Disturbances of the vestibular apparatus. Like the cochlear apparatus, the vestibular apparatus may be divided into its peripheral and central portions. The peripheral portion includes the static labyrinth and the vestibular nerve. The central portion includes the vestibulocerebellocerebral tracts and the cerebral center in the temporal lobe. Also, the peripheral and not the central portion is more frequently involved in skull fractures.

The symptoms indicating injury of the peripheral portion of the vestibular apparatus are vertigo, spontaneous nystagmus toward the healthy side, past pointing toward the diseased side, nausea, vomiting and disturbances of equilibrium. Tinnitus and deafness are usually associated. The patient prefers to lie on the healthy side because the spontaneous nystagmus is toward that side. The vertigo, of slight duration and annoying in the beginning, is toward the diseased side. It gradually disappears completely or is only noticeable in stooping. Vertigo and nystagmus usually disappear after one year. Nystagmus was present in 25 per cent. of the patients in the Breslau Sanitarium for accident cases.

The Barany tests of the vestibular apparatus in the

destructive type of lesion of the static labyrinth show an absence of response to the turning and caloric tests, and if the vestibular nerve is involved the galvanic test will be absent on the affected side. A severe injury to the vestibular apparatus nearly always involves the cochlear apparatus, and usually total deafness on the affected side is present.

A comparison of the relative value of the roentgenologic and otologic aids in the diagnosis of basal skull fractures would be of interest. A positive roentgenologic diagnosis of skull fracture was made in 133 instances, of which 105 were not subsequently confirmed by operation or necropsy, and there was no roentgenographic evidence of skull fracture in 96 cases, of which 17 were found to have a skull fracture at necropsy.

Because of the great difficulty of detecting a fissure fracture of the skull, and especially of the base roentgenologically in suitable cases, we should add the functional tests of the cochlear and vestibular nerves to our diagnostic armamentarium.

Pathology and Surgery of the Eustachian Tube. T. H. Halsted[3] discusses the changes in the eustachian tube occuring from infection and reviews the various procedures for closing the tube permanently.

The author believes that probably 50 per cent. of all radical mastoid operations, regardless of the technic employed, are unsuccessful so far as leaving a perfectly dry ear is concerned, and yet probably 95 per cent. of the operations are highly successful so far as relieving the patient of the much more important symptoms and conditions, present or threatening.

There are other causes of failure to procure a dry cavity than those of the surgical technic employed in the operation or in the local after care. Mucoperiosteum may be left, carious bone may not all be seen and removed, no matter how painstaking the operator, scabbing crusts will form on the epidermatized surface of

(3) Arch. Otolaryng., September, 1926.

the wound, though the tube be sealed. Undernourishment, environment, diabetes, tuberculosis, syphilis, lack of sunlight and outdoor living are some of the general conditions that prevent healing of the bone and cicatrization of the tube with its closure, and which should not be disregarded in the treatment. Regardless, however, of the character of the operation and the method of epidermatizing the cavity and the kind of flap used, there are a certain percentage of cases, too many for comfort, which will defy our best efforts to bring about a result satisfactory alike to the patient and to the otologist.

Paracusis. From their observations and experiments V. O. Knudsen and I. H. Jones[4] conclude the following:

1. Paracusis is found only in the individual with a hearing impairment of conductive type. This conductive lesion is usually of a rather marked degree. It seems that unless the conductive lesion is well advanced, the phenomenon of paracusis does not appear. Paracusis seems to be the natural consequence of bilateral conductive lesion. The degree of paracusis was found to be in proportion to the degree of the conductive lesion.

2. A noise impairs the hearing of everybody, irrespective of the degree of hearing or the nature of the hearing defect. This was found to apply to the hearing of pure tones, as well as to the hearing of conversation. In all of the tests the same result was obtained the greater the noise the less the hearing. It is of particular interest that the paracusic exhibits no physiologic pecularities. On the contrary, the evidence indicates that his auditory mechanism conforms to the usual concepts of auditory function. Therefore, it is not necessary to burden the hearing mechanism of the paracusic with a special and peculiar physiology. In view of this, there is little wonder that the many attempts to explain the peculiar phenomenon have not

(4) Laryngoscope, September, 1926.

been in agreement with the basic principles of the mechanics of harmonic motion. It is not necessary to postulate that the gross vibrations, produced by a noise, render the ear more sensitive to smaller vibrations—or to make any other attempted explanation, for the simple reason that the individual actually does not hear better in the presence of a noise. It is not necessary to attempt to explain why these individiuals hear better, because they actually do not hear better.

The question of paracusis, therefore, seemingly presents a paradox. The paracusic patient is himself convinced that he can hear better in a noisy place; certain tests have shown that he does not enjoy a peculiar advantage when conversing with normals or individuals with perceptive deafness, in the presence of a noise.

The following facts explain this seeming paradox:

1. The noise is not so disturbing to the paracusic as it is to all other individuals. In order words, an individual with a conductive impairment of sufficient degree to give him paracusis is less disturbed by a noise than any other type of individual. The conductive type of hearing impairment is characterized by a much greater loss of acuity for the low frequencies than for the high frequencies. This is consistent with the auditory masking of tones as demonstrated by Fletcher, Wegel and Lane.

Again, the paracusic has greater acuity for the medium-pitched frequencies, than for the low-pitched frequencies. Good hearing for these medium frequencies is more important for the hearing of speech than good hearing for the lower tones. Therefore, the paracusic has relatively good hearing for those frequencies which are most important for the hearing of speech. Average speech lies within the frequency range of 60 to 6000 d. v. The work of Fletcher shows that those frequencies in the range of 1500 d. v. are the most important for the hearing of speech. Those important frequencies of speech which determine its intelligibil-

ity lie within the range of about 1000 d. v. to 2000 d. v. To the extent of the author's clinical experience, the paracusic appears to exhibit relatively good acuity within this particular range, as shown by the hearing charts. All of the paracusics seen have shown poor acuity up to an average of about 512 d. v. Above this frequency, their hearing improved to about 2000 d. v. or 3000 d. v. From this point up they have varied greatly, some of them continuing up to the normal upper pitch limit of hearing, where others cease to hear above 5000 d. v. or 6000 d. v.

The above considerations explain why it would be expected that a paracusic would enjoy a relative advantage in the presence of a noise. Although ordinary noise is made up of frequencies throughout the entire audible range, yet a considerable portion of the energy of the noise lies in the frequency range below 512 d. v. As a paracusic hears very poorly these tones below 512 d. v., he is relatively less disturbed by them. Again, it is these particularly low frequencies that produce the greatest masking effect for speech, as shown above. A noise therefore, does not make the speech so much for the paracusic as for the normal.

There is another factor, which, in the presence of an excessively loud noise also acts in favor of the paracusic. If the noise is so loud that the conversation must be maintained at a loudness of more than eighty sensation units, the very loudness of this conversation introduces a distortion for the normal, but not for the paracusic. Because of the conductive impairment of the paracusic, the conversation and the noise are both correspondingly reduced in loudness and may not be louder than about forty sensation units, when it actually reaches the cochlea. Because of the nonlinear response of the ear, the very loud sounds of the conversation, as well as of the noise, introduce a distortion.

Incidentally, in contrast to those who have conductive hearing impairments, persons with perceptive im-

pairment claim they hear less well in the presence of a noise than in the quiet. Many of the authors' observations upon individuals having perceptive impairment confirm this claim. It is well established that individuals with nerve deafness suffer a much greater loss of acuity for the high-pitched tones than for the low-pitched tones. Further, the defect is one of the perceptive apparatus and not of the transmitting mechanism. Since they have good acuity for the low tones, they experience the full detriment of the masking effect of low tones.

2. Obviously the paracusic enjoys an additional advantage when he is conversing with a normal or an individual with perceptive deafness, in the presence of a noise. The normal individual always speaks louder in the presence of a noise because he hears the noise. He is conscious of the noise and attempts to speak above this noise. When conducting speech tests, the noise being produced by the loud-speaker, the caller notices that he is speaking very loudly when the noise is suddenly stopped. This was confirmed by repeated observations throughout the progress of the tests. The paracusic, on the contrary, does not hear the noise very well and yet he hears his own voice abnormally well because of his conductive lesion. For this reason the paracusic does not speak loudly in the presence of a noise. Therefore, the paracusic is getting the benefit of the louder speech, spoken by the normal individual where as the normal individual is attempting to hear the much feebler speech of the paracusic. This contributes greatly to the relative advantage of the paracusic.

Choked Disks. H. I. Lillie[5] reports four cases of choked disk associated with mastoid disease without apparent intradural involvement. The first patient was found to have a parasinous abscess, later complicated by toxic nephritis; in the second case little

(5) Arch. Otolaryng., October, 1925.

pathologic change was found in the mastoid cells, and later exploration of the brain revealed no abscess; in the third case a large cholesteatoma was exerting so much pressure on the sigmoid and dura over the cerebellum that the dura was found definitely indented; in the fourth case pachymeningitis extended over the petrous portion to the anterior surface, and a parasinous abscess was found.

The four patients with choked disk associated with surgical mastoditis recovered completely. There was no conclusive evidence of intradural extension, although it could not be definitely excluded. Three patients were found to show intracranial involvement in the form of a parasinous abscess; the other showed a pachymeningitis and a large cholesteatoma formation pressing on the sinus and cerebellum. One patient was subjected to intradural exploration without result.

The mechanism of choked disks in such cases is a moot question. Intradural exploration without more conclusive evidence of intradural disease is not warranted. The fundi oculi should be examined in all surgical mastoid cases. The incidence of choked disks in surgical mastoiditis without intradural extension is low, but sufficiently frequent to be considered in the differential diagnosis.

Touch as Substitute for Hearing in the Interpretation and Control of Speech. A series of experiments is being conducted by R. H. Gault[6] in an effort to cause the deaf to understand speech through the tactile sense. The fingers of the deaf "listener" are placed in contact with an instrument similar to a telephone receiver while he speaks into the transmitter. Gault states that there are thousands of persons for whom hearing is an unknown art. If the human voice can be made to break into them through their skins, well and good. The notion represents a bit of pioneering, and the theory is good. It has stood the test of experiment so far, for a

(6) Arch. Otolaryng., February, 1926.

group of deaf-mutes have worked successfully by touch alone with several hundred words and elementary sounds, and have, in the same manner, interpreted several hundred sentences.

The experiments are psychologic and are limited to the field of tactual sensation or sensations of touch. More particularly, they relate to the niceness with which one can discriminate among groups of patterns of tactual stimuli: stimuli that are applied to the skin of the observer or subject of the experiment when the vibrations of a speaker's vocal apparatus in speech impinge on it through the mediation of a suitable instrument that is held against the observer's skin. The experiments relate to the possibility of remembering these impressions; of developing an imagery in terms of tactual experience far beyond what people of normal sensory equipment know anything about.

Toothache of Otitic Origin. Casterán[7] relates that he has encountered a number of cases of otitis media in which pain in the teeth was the predominant element in the clinical picture. The dentists could find nothing to explain the odontalgia, but it subsided at once and permanently after the cure of the ear affection, or even after mere paracentesis. There was nothing to indicate seepage of pus, and the crossing of the nerve fibers in Arnold's ganglion readily explains the secondary neuralgia and its limitation to certain lower teeth.

The Treatment of Aural Diseases. In the preventive treatment of aural diseases that are most likely to lead to complications, early intervention is the main feature.

Acute otitis media is the most common of these conditions. It is always the beginning of a series of events that may lead to mastoid abscess, meningitis, brain abscess, sinus thrombosis, and death. Taken at the earliest stage, it may be a very simple matter. Pain, the principal symptom, can always be relieved by the

(7) Revista Medica Latino-Amer., April, 1926.

application of heat, which also sometimes allays the inflammation, and seems to prevent the formation of an abscess. E. U. Buckman[1] orders one drachm of chloroform in one ounce of olive oil, to be used as hot as can be borne, and directs that the ear canal be kept filled with this mixture. The hot-water bag or electric heating pad may do as well, or better. Heat is the important thing; but it should be used in a very early stage, and not more than a few hours unless there is marked relief.

It is much more usual to get the patient when there is evidence of fluid in the middle ear, and then puncture of the drum membrane is the only procedure worth while, and the results are generally very satisfactory. The size and shape of the opening does not seem to make much difference, so long as it is in the lower portion of the drum membrane, and posterior, to favor drainage. Puncture of the drum membrane is equally useful when not imperative; *i. e.*, in painful redness of the membrane, before fluid has accumulated in the middle-ear cavity. It gives almost instant relief, and is usually not followed by any discharge.

The treatment after puncture of the drum membrane is important. External heat applied to facilitate discharge, and dry cleansing are usually all that is necessary. A syringe or any form of flushing should not be used in an acute inflammation of the ear.

It is the author's belief that mastoid abscess not infrequently follows the injudicious use of the ear syringe or some sort of flushing. The use of this form of treatment should be condemned. Dry cleaning with cotton on an applicator under good illumination has given the best results. Home syringing of a suppurating ear in any stage is absolutely wrong. A syringe should never be used except by the doctor, and then only to remove foreign matter other than fluid pus, and followed by very careful drying with cotton. Long-

(1) Atlantic M. J., June, 1926.

standing discharges cease and dry up very promptly when syringing is stopped.

Care of the nose, nasopharynx, and throat is important to prevent acute inflammations.

The complication to be feared, of course, is mastoid abscess. Again, early intervention is most important. The sooner the diagnosis is made the better, and it can be made without the classical symptoms—redness, pain, and swelling over the mastoid process. Early operation is most essential if complications (meningitis, brain abscess, and sinus thrombosis) are to be prevented.

Patients should be taught that an acute rhinitis is not "just a cold," and that improper blowing of the nose may cause much trouble.

The family doctor, who usually sees the patients first, must be taught that earache is not just a pain, and that a child is not likely to live long enough to "outgrow" a running ear.

The Nose and Throat

GEORGE E. SHAMBAUGH, M. D.

THE NOSE AND THROAT

General Considerations

General Anesthesia in Eye, Ear, Nose and Throat Surgery. According to W. H. Long[1] the technic of tonsillectomy which contemplates a deliberate, painstaking dissection, requires a depth of anesthesia at which the reflexes of coughing, swallowing, retching and strangling are abolished. Hemorrhage control, suturing and ligating, sometimes prolonged and tedious proceedings, cannot be well carried out in a convulsive, spasmodic throat; hence the anesthesia under these conditions also must be if possible smooth and even. The anesthesia here becomes a safety factor inasmuch as the absence of these reflexes favors the keeping of the throat dry and clear, a difficult matter if material from below, vomitus, or mucus coughed from the trachea, is occasionally invading the field, in addition to the blood and saliva which are unavoidably present. Under conditions as above described, operating with head slightly lowered and using the suction apparatus together with a degree of anesthesia smoothly maintained in the first phase of the third stage affords the greatest safety to the patient, which is of course the first consideration, together with conditions that best facilitate the operator's work. The operations which are entirely without delaying or complicating factors, those which are rapidly performed and in which there is no hemorrhage, need no more than a few minutes of anesthesia.

As regards the agent used, the author finds that ether is frequently inadequate owing to its great volatility and the fact that with the mouth open no

(1) Kentucky M. J. March, 1926.

rebreathing is possible. He believes that a mixture of ether and chloroform, in the proportions of 3:1 respectively, is the most satisfactory. The anesthesia resulting resembles ether anesthesia in that good color is maintained, no circulatory depression is observed, and resembles chloroform anesthesia in the absence of profuse mucous secretion. This mixture is insufflated with oxygen sufficient to dissipate any cyanosis that may appear due to any mechanical obstruction from the presence of instruments or sponges in the throat, or from any other cause.

For children, in whom general anesthesia is contraindicated, nitrous-oxid-oxygen, or ethylene-oxygen, can be used for tonsillectomy, but the whole conception of the procedure as it is most frequently seen must be changed. An operator accustomed to a chlorether anesthesia would be handicapped by the light anesthesia of gas. Could gas be given by the usual method, *i. e.*, with a tight-fitting inhaler covering both mouth and nose, excluding the outside air, and employing a rebreathing bag, it would be adequate in depth, but we are forced to use a nasal inhaler only; and the secret of success is pressure to such an extent that a much greater volume of gas is forced through the nasopharynx than is inhaled into the lungs, much of it "looping the loop", *i. e.*, coming out the open mouth as soon as it escapes from behind the palate. Air exclusion and rebreathing are practically essential to success with gas anesthesia. Many of those who operate on tonsils routinely under gas-oxygen use the upright, sitting posture, and operate with great rapidity in a throat that is usually active with reflexes. The patient is awake and voluntarily expectorating within 2 to 3 minutes after the completion of the operation.

The question of local versus general anesthesia in tonsillectomy is one usually decided between the surgeon and the patient. Personally the author recom-

mends the former in an adult of some stability of the nervous system, a rather phlegmatic type, and of course in adults when a definite contraindication to general anesthesia exists.

The author does not believe that general anesthesia is very much more dangerous than local. There is the danger of the anesthetic itself, which is remote, though of course present. The available figures on post-tonsillectomy pulmonary abscess seem to show a greater percentage of these following general than following local anesthesia. But the Committee on Local Anesthetics of the Section on Laryngology, Otology and Rhinology found 27 deaths in two years from local anesthetics and reported its belief that the local anesthesia mortality was far greater than usually supposed, believeing that many such were never reported. Throughout the whole category of head operations including brain surgery, hare-lip and cleft palate operations, as well as operations upon the eye, the nose, and the mastoid and frontal sinuses, intra-pharyngeal oxygenated insufflation is employed.

For nasal work, which is rarely done under general anesthesia, the insufflation may be oro-pharynegeal discharging the vapor well over the base of the tongue. For eye work, frontal sinus, and mastoidectomy, the naso-pharyngeal or oro-pharyngeal method is suitable. Thus when anesthesia is well induced, and the insufflation technic is under way, the whole head or face may be draped off while the anesthetist at one side and out of the way can maintain the anesthesia without interfering with the aseptic technic and contaminating the field with hands, cones, and the like.

Gas may be very satisfactorily used in mastoid work if ether is contraindicated.

[The importance of the anesthesia in doing tonsil work cannot be overestimated. The risks from anesthesia largely hinge on the administration of the anesthetic. It is a more difficult anesthetic to give because

one must operate through the field through which it is given. The author's advice to give chloroform and ether does not meet with our approval. This form of anesthesia has long since been given up in other fields of work for ample reasons. Efforts to hurry through an operation in order to utilize the gas anesthesias is hardly to be sanctioned.—Ed.]

Hyperthyroidism: Its Significance in Otolaryngology. According to J. M. Waugh,[2] the main problem which confronts the otolaryngologist, in connection with hyperthyroidism, is on what basis to judge what shall be the primary procedure, that is, whether or not the patient shall be referred to the surgeon or the roentgenologist for primary treatment of the hyperthyroidism, or whether the infection shall receive the primary treatment. The necessity for recognizing the condition in patients who come to him either of their own volition or who may be sent by physicians who have not recognized the signs of hyperthyroidism is obvious, and here the otolaryngologist should be informed regarding the relative merits of radiation and of surgery in the treatment of the disease, and of the methods employed by the internist, in order that his judgment may be based upon a thorough knowledge of the most efficient prevailing practice.

Although radiation therapy has many adherents whose statistics appear to justify their claims, the author believes that the surgical removal of the gland is the only method whereby the hyperactivity can be directly and permanently controlled. In addition, even in an extremely mild case of hyperthyroidism in which it may appear both to the otolaryngologist and to the referring physician that removal of the focus of infection may be a sufficient measure to control the hyperactivity of the thyroid, the former should inform himself thoroughly by a physical examination and with the aid of the roentgenogram as to the relation of the

(2) Ann. Otol., Rhin., & Laryng., March, 1926.

gland to the trachea. It is of prime importance that the otolaryngologist know whether or not the trachea is in any degree distorted or compressed by an intrathoracic enlargement or other pathologic condition within the chest, which may increase the risk of the operation.

In general, the author believes that any otolaryngologic operation should, if possible, be deferred until the operation has been directed to the cure of the hyperthyroidism itself. The tragic sequelae of tonsillectomies performed upon patients with hyperthyroidism illustrate dramatically the extent to which the effects of each are intensified by the other. The writer believes that during operations certain deaths have occurred which have been due to unrecognized hpperthyroidism, or to some mechanical condition, such as pressure upon or distention of the trachea by a goiter.

It should be emphasized that a tonsillectomy, or other operative procedure, should not follow the operation upon the thyroid within less than from four to six months. Even when every possible precaution has been taken, a period of adequate rest should follow a tonsillectomy.

The author believes that the relation of infection to hyperthyroidism is not definitely known, and that the removal of a focal infection is not a cure for hyperthyroidism. When it is imperative that an operation be performed in the presence of hyperthyroidism, the presence of the internist at the operation and his cooperation during the period of convalescence is of utmost importance.

[This problem of hyperthyroidism and surgical interference of the tonsils is one that calls for sympathetic cooperation between the internist and the laryngologist. Usually where the laryngologist assumes the responsibility of passing on questions which come within the field of the internist, he falls as far

short of rendering the best judgment as would the internist in attempting to pass on problems peculiar to the specialty.—Ed.]

Spring Hay-Fever: Its Causes and Preventive Treatment. Spring hay-fever is caused chiefly by pollens of the grasses, the more important ones being sweet vernal grass, June grass, redtop, orchard grass, timothy, Bermuda grass and Johnson grass. Of minor importance are the tree pollens (oak, ash, cottonwood and black walnut), and the pollens of plantain, sheep sorrel and yellow dock.

Diagnostic skin tests should be applied to determine which pollens are the cause of the patient's hay-fever symptoms. Only those pollens known to be in the atmosphere at the time the patient experiences the most severe hay-fever symptoms need be used for skin tests.

Glycerolated pollen antigens, prepared by extracting the mature pollen grains in 66 2/3 per cent. glycerol and 33 1/3 per cent. saturated sodium chlorid solution, have proved remarkably stable and more potent than those obtained by any other method of extraction yet described. It has been demonstrated clinically that the use of glycerolated pollen antigens affords a high degree of protection against hay-fever symptoms. The intensive treatment comprises much shorter intervals between doses than were formerly used; larger terminal doses; and continuing the high doses through the height of the pollinating season.

The intensive form treatment as advocated by R. O. Clock[3] is started about two weeks before the hay fever season. For the first two or three days, doses may be given twice a day. Then a dose of pollen antigen is administered daily until a series of fifteen doses has been completed, usually about the time the hay fever season begins. Four or five higher doses are then given at intervals of three or four days to give the

(3) M. J. & Record, May 19, 1926.

patient the maximum protection during the height of the pollinating season.

Beginning with an initial dose of two and a half pollen units, the doses in the intensive treatment are progressively increased in strength up to terminal doses of two thousand or three thousand pollen units.

The intensive plan of pollen treament posses certain distinct advantages: (1) pollen tolerance or desensitization is brought about more rapidly; (2) reactions are fewer; (3) and a higher percentage of complete protection against hay-fever symptoms is secured. The method herein described of giving intensive treatment with glycerolated pollen antigens each year before the hay-fever season and continuing into the hay-fever season seems to offer the best means for the prevention of hay-fever. It is no longer necessary to forsake one's business during the hay-fever season and journey to a so-called hay-fever resort. Intensive treatment with glycerolated pollen antigens now affords hay-fever sufferers practically complete protection, so that they can continue to transact their business in their accustomed surroundings.

[The author seems to us rather too effusive in his praise of the vaccine treatment of hay-fever. Too often the patient finds no amelioration of his trouble by the vaccine treatment and very often, no doubt, where he has an amelioration, he attributes the result to the vaccine treatment which has had nothing to do with it. The severity of the paroxysms vary so widely in different seasons in the same individual in the same section of the country, that it is not always feasible to estimate accurately to what this amelioration is due. We are learning much more about hay-fever than we knew twenty-five years ago and it is to be hoped that the vaccine treatment will yet work out to be what we desire.—Ed.]

The Permanency of Hay-Fever Cures. The modern treatment of hay-fever is considered by most immunol-

ogists as being only of seasonal benefit. However, W. Scheppegrel[4] reports a series of eight selected cases where the reverse obtained. These cases show that the benefit from the desensitizing treatment of hay fever is permanent in a certain number of cases. The cases have been selected to illustrate that this effect may be obtained in cases of long standing (38 years), in the spring form, the fall form, the combined spring and fall, and in the perennial form of hay-fever. They are not sufficient in number to form any conclusions as to the underlying conditions of a permanent cure, but they undoubtedly form a basis for a further analysis for this purpose.

The cases were carefully selected so as to avoid other causes than the effects of the treatment in the result. It is well known, for instance, that patients changing their residence are sometimes relieved of their hay-fever, this being due to the fact that the pollens to which they are sensitive are not found in the new locality, or at least not in sufficient numbers to produce their hay fever reactions. Such cases have been carefully eliminated from this report.

In conclusion the author states that the desensitizing treatment of hay-fever is followed in a certain percentage of cases by permanent cure, and such cases should be carefully analyzed with a view of making such successful results more common.

It is quite possible that patients are given the preventive treatment of hay-fever who are already sufficiently desensitized. Patients should, therefore, be carefully tested before the opening of their hay-fever season, not only with a view to outlining the preseasonal treatment, if required, but also, in case of a negative reaction, to avoid inflicting an unnecessary treatment on the patient.

---

(4) M. J. & Record, Dec. 2, 1925.

The Rhinologic Aspects of Allergy. It is the belief of G. M. Coates[5] that the connection of rhinology with allergy is as follows:

1. In certain types of allergy, notably vasomotor rhinitis, perennial hay-fever or atopic coryza, and asthma, a nasal examination may be of great assistance in establishing a diagnosis.

2. It would seem that certain types of vasomotor rhinitis and asthma may have their origins in nasal pathology as follows:

(a) In an individual predisposed by heredity or otherwise to hypersensitization, allergic reactions in the mucous membranes of the upper respiratory tract may be excited by the absorption of bacterial proteins from paranasal sinus infections.

(b) In individuals suffering from allergic reactions —asthma, hay-fever and vasomotor rhinitis—due to the action of inhaled or ingested foreign proteins, such as pollens, animal emanations or foodstuffs, abnormal conditions in the nose may precipitate an attack, may increase the hypersensitiveness of the individual, or may reduce the general vitality and resistance, thereby rendering desensitization methods partially or totally ineffective.

(c) Certain forms of asthma and vasomotor rhinitis are accepted as due to reflex action from nasal pathology. These must be differentiated from true allergic reactions. Their cure lies in nasal surgery or treatment.

(d) Physical allergy—so-called—causes vasomotor symptoms from stimuli such as heat, cold and light, applied either directly to the mucous membranes or to other parts of the body. Those applied to the skin distribution of the branches of the fifth nerve are most marked.

3. Nasal treatment of allergic cases consist in:

(a) Freeing the nose from any source of infection

(5) Ann. Otol. Rhinol. & Laryng., September, 1926.

present. This usually means draining the maxillary sinuses, the anterior ethmoid cells and at times the sphenoids.

(b) In case of asthma where sensitivity cannot be demonstrated, search for local sensitive spots and the removal of tissue that may be responsible for reflex symptoms by pressure.

(c) Proper ventilation and drainage of the nose as a general measure for restoring the patient's general health.

(d) The preparation and administration of autogenous vaccines after appropriate surgical procedures to eliminate remnants of infection and to overcome bacterial sensitization of the mucous membranes locally and the general allergic condition.

(e) Blocking the branches of the fifth nerve supplying the nasal mucosa or injecting the sphenopalatine ganglion itself.

(f) All of these measures may be indicated at times to combat contributing and complicating factors, such as the chronic bronchitis of asthma and the secondary infections in the latter stages of hay-fever attack.

4. In the management of these cases of allergy, it would seem that the best results must be obtained only by close cooperation between the allergist, the internist, and the rhinologist.

The Inefficacy of Intravenous Calcium Injections in Asthma, Hay-Fever, and Allied Conditions. In all, A. A. Thommen[3] treated 19 cases of asthma, belonging for the most part to the nonsensitive type. Two preparations were used: (1) a 5 per cent. solution of calcium chlorid in doses of 5 to 10 c.c., (2) a proprietary in the form of a 10 per cent. solution of calcium urea. Some cases were treated exclusively with one or the other. The majority, however, received injections of both. A total of 198 injections were administered. They were apparently very well borne, for no

(3) New York State J. Med., Aug. 1, 1926.

untoward effects were observed. In several instances the possibility of a resulting kidney irritation was considered, but not substantiated. The injections were invariably accompanied by a sensation of intense heat, felt most commonly in the chest, the temples, and the rectum, occuring within a few seconds of the beginning of the injection. This evidently disagreeable sensation is very fleeting, and is easily controlled by giving the injection slowly. The caustic, escharotic nature of calcium, evidenced when injected into the subcutaneous tissues, was not observed. It is, however, a possible accident which must ever be kept in mind.

With the exception of two children, aged 11 and 13, the group was composed of adults, seven males and ten females. The duration of illness varied from three to 32 years, with the average about ten years. The injections were administered bi-weekly in most cases; in others, every day. One patient, who was considered a particularly good subject, received injections twice daily for four successive days. The number of treatments given was as follows:

One received 5 injections; four received 8 injections; six received 10 injections; five received 12 injections; two received 13 injections; one received 15 injections.

Results.—No marked effects were observed in any case. When used as a succedaneum for adrenalin, to control the paroxysm, it proved entirely valueless. In a few instances an apparent improvement occurred with the first injection. This, however, was always short-lived, and could easily be explained on the basis of the psychological effect produced by a somewhat impressive mode of therapy, or as a natural period of amelioration.

Another means whereby the value of intravenous injections of calcium might be established, perhaps more accurately, is to observe its effects in those allergic conditions in which the various syndromes are more definite and clearcut, and less apt to be masked by co-

existing complications and sequelae. Hay-fever, urticaria, angio-neurotic edema and serum sickness lend themselves in something of an ideal manner to the study of the efficacy of any particular mode of therapy. Calcium administered intravenously has been recommended for these conditions in the same positive manner, and with a show of the same type of enthusiasm, as in the case of asthma. Any estimate, therefore, arrived at in regard to these ailments, might with reason be used as an aid in the interpretation of the results obtained in the treatment of asthma.

Injections of pollen extracts, given prophylactically, represent the most efficacious method for the treatment of hay-fever. When given prophylactically, the results are less certain and rarely as beneficient.

In this study of hay-fever, both Afenil and plain calcium chlorid were used. The cases grouped themselves as follows:

A.—Undiagnosed cases, two.

B.—Cases seen for the first time after the onset of symptoms, fifteen.

C.—Cases treated prophylactically, but which developed moderately severe symptoms, fifteen.

In each instance an endeavor was made to give this mode of treatment an adequate opportunity to demonstrate its effectiveness. Hence, the number of injections was always in excess of that recommended.

In group A, the two cases belonged to the early type, with seasons respectively from about May 15 to June 6, and April 20 to May 10. From their histories of recurrent attacks, the former for 38 years, i. e., since the age of four, the latter for ten years, and their symptoms, they are undoubtedly cases of hay-fever, yet both gave negative skin and eye tests to the grasses and to a goodly number of tree pollens, except a strong extract of Scarlet Oak, i. e., .05 mg. of nitrogen per 1 c.c.

They received treatment with scarlet oak empirical-

ly, and nine injections each of calcium intravenously, three of which were given within the week just preceding the onset. It was very evident that neither the pollen extract nor the calcium had any effect on the onset, duration, or intensity of the symptoms.

In group B, fifteen cases were treated prophylactically with appropriate pollen extracts, and a total of 60 calcium injections.

Six patients received 3 injections; six patients received 4 injections; three patients received 6 injections.

Results.—They must be reported as negative, for there was no apparent difference from similar cases treated only prophylactically.

In group C, an attempt was made to use calcium in an endeavor to bolster up the results obtained in previous years with pollen extracts in a selected number of cases.

Five patients received 3 injections; six patients received 4 injections; three patients received 6 injections.

Results.—Here, too, the results were negative, apparent benefits being easily explained by natural variations in the intensity of symptoms.

Four cases of urticaria, two of angio-neurotic edema, and one of serum-sickness were treated by means of calcium injections. In none of these cases was there any benefit, definite and readily apparent.

Conclusion.—In view of these facts, one is constrained to record the conclusion that intravenous calcium therapy is of doubtful value in asthma, hay-fever, and cognate conditions.

[The results recorded in this paper conform more closely to the experience which our own personal acquaintance has uncovered than do the more enthusiastic reports in other articles that have been published. It seems, therefore, that calcium is an inert substance, thus having no effect whatever on asthma or hay-fever. The article throws light on the treatment of hay-fever

by pollen preparations. The severity of attacks of hay-fever vary from season to season and when it chances that someone is undertaking prophylactic treatment by pollen extracts and the patient has a milder season, much enthusiasm is expressed for this treatment. Very little, however, is mentioned about the case where, in spite of prophylactic treatment, the patient happens to have a severe summer. There may be a modicum of benefit derived from pollen preparations but the practical results that we have observed do not warrant any great enthusiasm for this line of treatment—Ed.]

An Experimental Study of Acute Cocain Poisoning, Its Prophylaxis and Treatments. From this laboratory study, A. L. Tatum[1] comes to the following conclusions:

1. Poisoning by subcutaneous injections of cocain cause death by respiratory failure.

2. Artificial respiration is an effective treatment only in the rabbit, the lowest type of animal employed in this series. In the higher types—the cat, dog and monkey—artificial respiration was of no avail.

3. The intravenous injection of appropriate hypnotics such as a mixture of barbital-sodium and paraldehyde cause immediate cessation of convulsions.

4. Hypnotics must be given in such a quantity as to prevent any and all manifestations of cortical or clonic convulsions.

5. The longer the convulsions are allowed to continue before the administration of the hypnotics the greater is the danger of failure of the treatment, consequently the treatment should be instituted as soon as possible after clonic convulsions appear.

6. A prophylactic administration of the hypnotics raises the tolerance to the greatest extent.

7. Since the efficacy of the treatment parallels the increasing complexity of development of the brain in the series of animals employed, it should follow that

(1) Illinois M. J., June, 1926.

man should be still more susceptible to this type of treatment. As to the dosage to be employed the author can only guess. His suggestion is to employ a dosage equal to or slightly larger than the usual standard hypnotic dose. If this is insufficient to completely check the clonic convulsions, a cautious increase in dosage would be indicated.

Lateral Cervical Fistulae. According to R. Kramer[2], Wenglowsky in 1913 was the first to clearly demonstrate that these fistulae originated from the thymic duct. The duct arises in the third pharyngeal pouch and passes downwards, outwards and somewhat backward, then going off at an angle, it courses downward, inwards and forwards to reach the infrathyroid region, above the cardiac area. It usually becomes obliterated about the sixth week of fetal life. However, portions or all of the duct may remain patent and later give rise to lateral cervical cysts or various types of fistulae. The external or cutaneous opening is on a line parallel to and overlying the anterior border of the sterno mastoid muscle, usually between the hyoid bone and the sternoclavicular junction.

The internal opening is almost invariably on the posterior palatine arch or directly in front or behind it. The fistulae generally present areas of squamous and of cylindrical (ciliated or nonciliated) epithelium. There is a well defined circular coat of connective tissue present, and numerous lymphocytes often collected in distinct nodules are to be found in the wall. Muscle fibers and mucous glands are often present; less frequently, cartilage and hair.

Lateral cervical fistulae may be present or they may appear in later life. Most frequently they first become evident at the age of two or three years. Varying quantities of serous or purulent fluid may escape from the cutaneous opening. In some cases the annoying discharge is the only symptom.

(2) Laryngoscope, July, 1926.

The internal or pharyngeal orifice may also be the site of discharge, the patient not infrequently complaining of a disagreeable taste as the result of the presence of pus or decomposed food. Injection of fluids with a distinct taste or a definite contrast color has been employed to detect the presence of a complete fistula. The elevation of the external orifice on swallowing is considered by Leegaard evidence of the presence of a tract, patent or partially obliterated, attached to the pharyngeal wall. Attempts at probing the entire tract have rarely been successful.

A very few cases have been stated to have healed up spontaneously. A few fistulae have been obliterated by the injection of chemicals, such as trichloracetic acid. The majority of healed cases have been treated surgically; that is, dissection of the entire tract.

Most of the patients have not submitted to any treatment, because the symptoms were not very numerous or disturbing and the surgical procedure extensive, somewhat deforming, and often unsuccessful.

The author reports the case of a female, aged 29, who developed a tender swelling just above the right sternoclavicular joint three weeks after tonsillectomy. The swelling ruptured, with the escape of pus. Since that time, during an interval of two and one-half years, until the author saw her, the patient suffered from periodic discharge from the fistulous opening, and also noted pus discharging from the right side of the throat.

On examination an opening was found in the right tonsillar fossa, from which a few drops of pus could be expressed. Operation on the tract was advised but the patient refused. For this reason tincture of iodin was injected in an attempt to obliterate the tract. However, one week later on irrigating with one per cent. acrioviolet through the internal orifice, a few drops escaped from the external opening.

A bismuth and oil mixture was injected into the

Antero-posterior view showing injected fistula.—Kramer, page 345.

tract and an *x*-ray picture taken (Pl. XXIV). The *x*-ray revealed a tract following the course described by Wenglowsky. The author believes that the injection of opaque material such as bismuth and oil is of great aid in these cases. In the present case an abscess developed, which however, the author believes was due to a previous injection of Beck's Paste. Draining of the abscess was necessary, but the fistulous tract has remained as before. The patient has still refused operation and the author is considering injection of trichloracetic acid.

Hemorrhagic Cysts of the Neck. Jura[3] reports the case of a woman, aged 20 years, who, thirteen days after her first delivery about two and a half years ago, noticed a swelling about the size of a walnut in the lower part of the left lateral cervical region near the supraclavicular fossa. This growth was soft and elastic and covered with normal skin. It did not pulsate. It increased slowly and progressively in size, but did not cause any pain or other symptoms. By the end of a year it had reached the size of a small egg. It was then punctured twice, about a liter of dark blood being evacuated. Two months later the swelling had regained its former size.

During the patient's second pregnancy the tumor did not change much in size, but after delivery it grew again and there was a pulling pain in the left shoulder on use of the arm. Under novocain anesthesia, an incision was made parallel with the posterior border of the sternocleidomastoid. The cyst which lay between this muscle and the trapezius, was easily isolated and removed. It was not connected with the internal jugular. The transversalis colli artery, which was attached to its posterior surface, was sectioned.

Histological examination of the cyst wall showed that it had a structure of a vein wall which had been changed by endophlebitis causing considerable thick-

(3) Policlinico, Rome, 32, 1925.

ening of the intima. The cyst was evidently a hemorrhagic cyst due to phlebectasia of the transversalis colli. The author suggests that the weakness of the vein appearing subsequent to pregnancy may have been congenital.

Hemorrhagic cysts of the neck are generally located in the lateral cervical, supraclavicular, carotid, submaxillary, or subhyoid region, between the median and deep cervical aponeuroses. They never show true expansive pulsation, but if they are connected with an artery, pulsation may be transmitted to them.

They very rarely cause pain. They are differentiated from solid tumors by their consistency, from aneurysm by their lack of pulsation, from cavernous angioma by their lack of erectility, and from soft tumors and other form of cysts by the findings of exploratory puncture.

The treatment is radical removal of the cyst after ligation of the vessel on which it is implanted. In some cases it may be necessary to remove a section of the vein. Adhesions may be present, but often a plane of cleavage may be found. Methods of bringing about coagulation by chemical agents are dangerous as they may cause embolism.

Diseases of the Nose

Nasal Deformity

A Method of Nasal Plastic Repair by Cartilage Graft. The method described by E. Watson-Williams[5] is especially useful in the type of deformity where the depression extends high up.

An incision is made in the skin, beginning at a point half-way along the lateral margin of one nostril, running forward along this margin to the anterior end, being carried thence across the front of the columella transversely to the corresponding point on the opposite side, and down the lateral margin of the other nostril to finish opposite the starting point (Fig. 25). From

(5) Brit. M. J., Nov. 28, 1925.

this incision, dissection is carried forward to the tip of the nose, raising the skin,and over the tip upwards. The skin here is tightly bound down to the nose, and sharp dissection is necessary until one arrives about half an inch above the tip. Thence a narrow tenotome is inserted under the skin as far as the glabella, the skin being raised by a narrow elevator, and by pinching up from outside. With the same knife, and also

Fig. 25.—Line of incision.

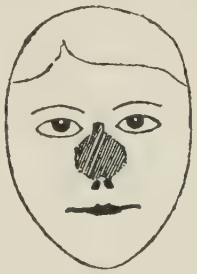


Fig. 26.—Area of skin raised.

with blunt-ended tenotome, the skin is freed on either side of this central passage; the width to which this is carried depends on the amount of depression; there must be no tension in the skin after the graft has been inserted, and any error in this step is likely to be a too sparing rather than a too wide freeing (Fig. 26).

This part of the dissection is easily accomplished; but special care is needed in passing from the sides of the nose on to the cheeks, where a region of firm attachment of the skin seems to be the rule. The progress of this, the most important part of the operation, can be watched from outside. During the dissection bleeding is apt to be free. The cavity can be inspected by means of Sir St. Clair Thomson's speculum or a narrow Killian speculum, inserted at right angles to the usual direction so as to open anteroposteriorly.

When a satisfactory cavity has been prepared it is

packed to arrest bleeding. A piece of rib cartilage, somewhat larger than seems necessary, is now cut and shaped roughly. The packing is removed and the final fitting and trimming of the cartilage is carried out, the graft being tried in position to ensure accuracy. The tip of the nose, if formerly raised, will be brought down appreciably by this maneuver: hence the reason for cutting the graft at first rather large.

The graft can be made to take a firm support on the nasal bones, a small notch on the under surface preventing any tendency to ride up. The lower end may be brought down quite to the new tip of the nose, and shaped to give a round tip. Three points of horsehair suture close the incision. Firm pads are applied on either side of the nose to prevent lateral displacement during sleep, but no dressing is used over the tip of the nose.

The advantages of this method are:

1. The approach to the part avoids mucous surface: the operation may be regarded as aseptic.

2. Very wide freeing of the skin of the depressed part is possible.

3. The dissection may be extended as high as is needed: this is specially useful when treating high depressions.

4. It is possible to bring the graft down even below the former tip of the nose: it will not even there rest against an incision: if necessary, a second graft can be inserted in a channel in the columella, to raise the depressed tip.

5. The graft may be fitted and altered before closing the incision.

6. No scar is made on the front of the face.

Correction of Nasal Deformities. W. W. Carter[6] believes that few plastic surgeons have paid any attention to the embryology and development of the nose in

(6) New York State J. Med., December, 1925.

connection with the correction of deformities of this organ.

The external nose does not acquire its definite, individual form until after birth, and for sometime afterward marked changes occur, both intra- and extranasally. As a rule racial characteristics are delayed until after puberty, but the racial trend is often noted sometime before this epoch. In the white races the nasal bones are large and prominent, while in the yellow and dark races they are small and narrow, and are insignificant as segments of the nasal arch. The nose from both a mechanical and architectural point of view is an arch; that is, it is a curved structure made up of an indefinite number of segments, and capable of preserving its integrity though supported only at its extremities. The upper edge of the septum is not only one of these segments, but it performs the important function of the keystone of the arch. Consequently, if this is destroyed, as by an abscess of the septum or if it is displaced either by accidental traumatism or during the performance of the submucous operation, the arch becomes re-established on a lower plane and a saddle-back deformity results. The fact that the nose is a tent-like structure of skin and soft tissues supported by this arch of bone and cartilage must be kept constantly in mind by the surgeon.

The author strongly advocates the intra-nasal route of operation. It is only the novice in the field of plastic surgery that recommends the external route. In the author's bone and cartilage work he always uses the autogenous graft from the rib. He prefers this to the shin-bone because a section of the rib is easily removed and shaped to suit the deformity; moreover this bone is richly supplied with nutrient foramina and has not the ivory-like texture of the tibia. He preserves the periosteum on the outer surface and then splits the rib, using the outer periosteum-covered half and includes more or less of the cancellous tissue, depending

upon the thickness desired. If it is necessary for the transplant to extent into the tip of the nose, the author removes the graft at the junction of the rib and costal cartilage, the lower one-third of the transplant consisting of cartilage and the upper two-thirds of bone. This preserves the resiliency of the nasal tip. If the tip of the nose has a tendency to droop, a supporting bone strut is placed in the lower edge of the septum. In his early work, the author used on several occasions bone grafts without periosteum: these showed little vitality and were useful chiefly as a framework for the growth of bone from the adjacent periosteum-covered bone with which it is was placed in contact. Periosteum-covered transplants have inherent power of growth and should generally be used in this work. Under no circumstances should paraffin or any other foreign body be introduced into the living tissues.

The nature of the surgical interference in children must be decided upon in each individual case, for the indications vary. If it is absolutely necessary to use a transplant, autogenous bone must be chosen as this is a living tissue and capable of growth after transplantation. The author has cases that show that normal development proceeds where periosteum-covered bone is implanted in contact with live bone in the young.

Where there is extensive destruction of the soft tissues of the nose, it is necessary to use flaps. The author has found that the skin of the forehead, pedicled at the inner angle of the orbit serves the best purpose. When a bone transplant is necessary it should be implanted after the flap has become established in its new position and its vascular connections secure. The writer is opposed to making a tube of the flap as he thinks this procedure constricts the blood vessels. The flap is sutured down with as few stitches as possible. When the distal end of the flap seems pale and anemic, heat or even a leech, should be applied.

Newer Procedures and Methods in Plastic Surgery of the Face and Neck. Formerly the common saddle-back deformity of the nose was treated under ether anesthesia. Now, according to G. B. New[7], under regional and local anesthesia, the full thickness rib is inserted to elevate the deformity through a small incision below the tip of the nose. The nasal part of the operation is also done under local anesthesia.

The simplest type of saddle-back deformity is that in which a large piece of cartilage is necessary, extending from the glabella to the tip of the nose. In traumatic nasal deformities, in which the nasal bones are displaced laterally, it is frequently necessary to rasp off the lateral deformity before inserting the cartilage. When the nasal deformity is due to loss of tissue below the nasal bone, the accurate approximation of the small piece of cartilage that is necessary to elevate this point requires considerable care and ingenuity.

The traumatic nasal deformities that require refracturing used to be treated by anesthetizing the patient with ether, and then, after placing a piece of gauze on the convex side of the nose, refracturing the nasal bones with a mallet. Now, under local anesthesia, through incisions inside the nostril on each side, the skin over the entire nose is freed; the nasal bones are refractured with special forceps, the convex side inward and the concave side outward, and then held in place with copper splints and gauze packing used intranasally if necessary. More accurate work can be done in this way than with previous methods.

The large nasal humps are usually readily corrected by means of rasps, saws and biting forceps, through an incision either inside the nose or just below the tip. The long-tipped nose may be made shorter and the upturned tip may be brought down into normal position

(7) South. M. J., February, 1926.

by intranasal procedures, portions of the septum and lateral cartilage being removed.

The loss of the columella in congenital syphilis is best treated by elevating a flap from the upper lip with the pedicle in the region where the base of the columella would be, and the distal end extending down to the vermillion margin, inserting a full thickness graft under this and suturing it back in place. After ten days this is elevated and tip sutured into position on the nose.

In the more extensive nasal plastic operations requiring flaps from the forehead, the use of full-thickness grafts, lining the distal part of the flap, in place of the Thiersch graft, is a distinct advance. A much better lining is made in this way than when the Thiersch graft was employed.

Full-thickness grafts used in the mouth on splints attached to teeth are also very satisfactory, and may be used on dental compound in correcting atresia of one nostril. Full-thickness grafts may be used in replacing pigmented scars about the face, low-grade basal cell epitheliomas, ectropion of the lower lip, pigmented hairy moles, and scarring of the neck and chin, in which delayed flaps from the back were previously employed. However, it is not well to attempt them in young children on account of the difficulty of getting sufficient cooperation.

In chronic lymphedema of the face, treatment is not satisfactory as a rule.

In cases of harelip and cleft palate the use of lead plates on both sides of the nostril, held in place with silk-worm sutures and lead shot, almost prohibits the possibility of a flared-out nostril.

The Use of Gold-Wire Splints in Intranasal Plastic Surgery. The gold-wire splint is made just before the operation and is shaped to suit each individual patient. First an obturator, somewhat in the shape of the Asch hard-rubber splint, is whittled out of white

pine; this is made a little smaller than the nasal cavity, around this obturator, in a spiral is wrapped a piece of No. 7 dental gold-wire usually about 12 inches long. The spiral thus formed is pressed firmly with the fingers, in order to overcome the tendency of the wire to straighten. The splint is covered with vaselin and transferred directly into the nose from the obturator, or it may be removed from the latter and introduced by means of a pair of long, straight hemostatic forceps.

According to W. W. Carter,[8] the splint is placed in the side where the incision is made first and then a similar one is introduced in the other side. When the splints are adjusted, the ends of the wire are bent inward. The anterior end of the splint should rest in the vestibule and below just within the anterior nares. Care should be taken that none of the wire coils are left pressing into the incision.

The action of these splints is to keep both nasal cavities wide open, and to hold in close contact with each other the submucous flaps by a continuous light, springy pressure. The advantage of this will be recognized at once by the experienced rhinologist. Hemorrhage, both primary and secondary, is less apt to occur: consequently the risk of hematoma with its attendant danger of infection and abscess formation, is very much less. The secretions from the nose and the drainage from the operative wound have free exit. The nasal cavities can be cleansed and the progress of the case noted by direct vision. It is difficult to estimate the advantage to the patient who is able to experience at once free nasal respiration and to enjoy the benefits of the operation as soon as it is finished.

Unless there is some contraindication the splint is removed on the third day. This is done by catching the ends of the wire with the thumb forceps and gently pulling. The coils readily straighten out and the

(8) Laryngoscope, December, 1925.

removal is effected with no difficulty and little discomfort to the patient.

Concerning the Free Transplantation of Bone, Cartilage, and Fat in Otorhinolaryngology. S. Bourack[9] comes to the following conclusions:

1. Free transplantation of bone, cartilage and fat is of great practical value in otorhinolaryngology (in nasal deformities, defects of the larynx and the trachea, and so forth). It also has a great theoretic interest, because this question is closely connected with various biologic problems (regeneration, function, immunity, constitution).

2. The comprehensive experimental and clinical literature concerning free osteoplastic procedure has not yet cleared up many important points (for instance, the main sources of regeneration, the part played by the periosteum, by the bone marrow, by the endosteum and the mother soil, or concerning the importance of the original place of the plastic material, living or dead, autohomeoplastic or heteroplastic, or concerning the end-results, etc.).

3. Some theoretical views on which some of our practical methods are based, as, for instance, in rhinoplastic work, must undergo a critical revision from a biologic standpoint. This applies, for instance, to the point of view of the doctrine of physicochemical affinity or contrary action of the tissues, their ability to survive, their possibility to be preserved in vitro.

4. The transplanted bone will mostly not participate in the healing process as such, but lasting results in a free osteoplastic procedure can be obtained only as consequence of secondary processes of regeneration which go hand in hand with processes of resorption.

5. The preponderating part played in bone transplantation of the bone forming elements has not yet been established, also not that played by the periosteum and by the bone marrow with endosteum. In the

(9) Ztschr. f. Hals—, Nasen—u. Ohrenh., 11:441, 1925.

clinic their positive part seems to have been proved especially in transplantations into the soft parts.

6. The result of free osteoplastic procedure varies not only from author to author, but also with the same author. The ends-results depend on various technical, local and general factors. There are certainly also some biologic causative factors which still need investigation.

7. The autoplastic transplantation in osteoplastic surgery furnishes better prospects, also in the bone layer. The processes of resorption preponderate in homeoplastic and heteroplastic operations, and in plastic with the aid of dead material. The newest investigations and experiments to correlate the outcome of the transplanted material with the hemologic-biologic reactions (isoagglutinins, organospecific substances, elements of the blood which favor regeneration after lesions, and the like) show the right way which must explain many obscure points of plastic procedure.

8. Critical revision of the literature, the author's own observations and theoretic considerations (as seen from the point of view of the physiologic function of the tibia, the importance of pressure on the transplant), seem to justify the author's skepticism concerning the classic method of rhinoplasty (according to Israel). In simple saddle-noses it is preferable to resort to protheses of paraffin and petrolatum or fat autotransplantation, or bone splinters from the nasal skeleton or its surroundings, for instance, from the nasal ridge or from border of the pyriform aperture.

The views of different authors vary concerning the value of free transplantation of cartilage. Parts of the auricle usually do not heal in the borders of defects of the alae nasi, according to the experiences of others and of the author. The use of cartilage in saddle-noses cannot be recommended, according to the experiences of the author, nor from a theoretic point of view.

10. A permanent cure and a permanent result in free chondroplasty can only be considered when the time of observation is rather long, on account of the torpid reaction of cartilage to various inflammatory, traumatic, infectious and other irritations, and on account of the little pronounced power of regeneration of cartilage.

11. The tendency of some modern, especially American, authors to use cartilage of the rib or of the nasal septum instead of bone, in saddle-noses, is based on little substantiated theoretic premises.

12. Fat transplantation deserves greater application in surgery and otorhinolaryngology on account of its physical and biologic qualities. The exaggerated skepticism of many surgeons and otorhinolaryngologists does not appear to be justified.

13. The end-results of free fat plastic operations depend on the method and technic, aside from various local and general factors.

14. The author's personal experiences speak in favor of fat plastic surgery. Aside from ordinary indications, its use is commendable in persistent parotitis fistulas, for instance after typhus exanthematicus and in a protracted torpid course of healing after antrotomies.

The Nasal Accessory Sinuses

Paranasal Sinus as a Focus of Infection in Children. A series of 145 cases of paranasal sinus infection are reported by E. C. Mitchell[1]. In this number there was involvement of the ethmoid in all instances, and alone, in 84 cases. The frontal sinuses and the sphenoid were involved each in two instances. Infection of the maxillary sinus was found in 59 cases. Of these 37 were surgical, 22 non-surgical.

The management of every case was first medical, and until proven of no value local sprays, including adre-

(1) South. M. J., September, 1925.

nalin, and suction were used in the acute cases. Local and general treatment was carried out in the more chronic cases. In the former, stimulating sprays and suction were used; in the latter, cod liver oil and heliotherapy.

The surgical treatment consisted in free continuous drainage of the antrum when it acted as a reservoir. To produce this drainage, a rubber tube was inserted into the antrum at the time of the operation, the tube remaining in place until the active drainage closed.

In all of the 145 cases causes other than the sinuses were excluded. The non-operative cases were in the majority, for the average sinus case if obtained early was less firmly established and more readily controlled. The operative cases were subject to relapses when exposed to subsequent infections. No case was considered cured until three years had elapsed. The discharge obtained from the sinuses was cultured in all operative cases, the streptococcus being the predominating organism. In a few instances, particularly the nephritics, the Staphylococcus aureus was isolated in pure culture. In staphylococcus infections the autogenous vaccine was found to be of greater value than in streptococcus or mixed infection.

In six cases of the series there was tenderness over the sinus involved. In three cases only was headache the chief complaint. The nasal discharge was more abundant posteriorly than anteriorly. Cough on lying down was the frequent complaint and sneezing on arising was fairly constant. Intense nervousness particularly on examination was a fairly constant symptom. This symptom complex was so marked as to be a great aid in diagnosis. In some cases a child who had formerly been tractable and easy to manage became unmanageable. There seemed to be an entire change of disposition. Some of these patients developed a distinct chorea.

The tonsils had been removed previous to develop-

ment of sinus infection in all but fourteen cases. In fourteen of the 41 cases the tonsils and sinus were found diseased on first examination. This would indicate that perhaps the sinus are often diseased at the time of removal of the tonsils and adenoids and the temporary improvement that occurs is because drainage of the sinuses is promoted. The author does not believe that removal of the tonsils increases the liability to sinus infection, but rather that the diseased tonsil is the original focus and is left *in situ* too long. The lymphoid child is subject to the various infections of the nasopharyngeal tract with its subsequent complications. Nasopharyngitis is often the first indication of a relapse due to the irritation of the sinus discharge.

[The fact that nasal sinuses can be involved in children seems only recently to have been appreciated by some pediatricians. Acute severe rhinitis is likely to have as one of its complications an involvement, to a greater or less extent, of the nasal sinuses. It is the exceptional case where this sort of complication calls for any operative treatment. We do not encounter in children, with any frequency, the chronic suppurative types with which we meet in adults. The assumption that the persistence of a bronchitis is dependent upon nasal sinusitis is not well founded. They are both a part of the same infection and it would be just as logical to assume that, if we cured the bronchitis the nasal sinuses would get well, as vice versa. The statement that the author does not consider a case cured until after a lapse of three years strikes us as rather interesting. A person may have a cure half a dozen times over in three years. Because he remains free from an acute attack in three years does not mean that he is going to remain free the rest of his life. If there are recurrences they do not indicate that there is persistent infection which needs surgical treatment any more than in otitis media. Children especially, not in-

frequently, go through a period a several years when they are subject to recurring acute attacks of otitis media brought on by each head cold. No one thinks of performing a radical operation on the ears to prevent such recurrences.—Ed.]

Hyperplastic Maxillary Sinusitis. In 48 radical maxillary sinus operations which were performed for the removal of hyperplasia not associated with suppuration W. Mithoefer[3] found the nasal chambers in 28 of the cases completely filled with polypi. In every instance of marked nasal polyposis, the mucous membrane of the antrum had also undergone polypoid changes. Most of the polypi in the nose were found to be but outgrowths of the antrum hyperplasia. In only one patient was the antrum wall found intact so that the hyperplasia in the maxillary sinus had no communication with the nasal polyposis. Solitary nasal and retronasal polypi were present six times. In every case the pedicle of the polyp had its origin within the antrum cavity. Mild hyperplastic ethmoiditis without polypi and with a coexisting marked hyperplasia of the antrum was present nine times. Repeated vasomotor disturbances of the nasal mucosa with the absence of pathological changes in the nose but with the existence of marked hyperplasia of the antrum found at the time of operation was observed in five cases.

Hyperplastic maxillary sinusitis may be present in four distinct types:

1. Antrum hyperplasia with extension of polypi into the nose combined with suppuration (mixed form—not included in present series).

2. Antrum hyperplasia with extension of numerous polypi or a solitary polyp into the nose but the absence of a purulent discharge.

3. Hyperplasia of the antrum without extension of polypi into the nose, but with the presence or not of mild pathological changes of the nasal mucous mem-

(3) Cincin. J. Med., February, 1926.

brane and other sinuses (primary hyperplastic maxillary sinusitis).

4. Hyperplasia of the recesses of the antrum only (recess hyperplasia).

During the process of an acute catarrhal inflammation of the antrum, the superficial layers of the mucous membrane show a marked cellular infiltration with serous exudation between the connective tissue cells. After the acute symptoms subside, the mucous membrane is probably somewhat thicker than before the inflammation existed. If the inflammatory process continues, the cellular infiltration penetrates to the subepithelial layers and surrounds the glandular structures resulting in marked edema of the mucous membrane. Probably, at this stage, the disease often becomes latent. With each succeeding acute attack, the already thickened antrum mucous membrane participates so that, eventually, fibrous degeneration of the connective tissue takes place with resulting hyperplasia and cyst formation from pressure of the new tissue on the glandular structures. It is hard to say how long a time elapses from the beginning of an acute inflammation to the stage of true hyperplasia: in some cases, probably many years: in others, depending on the severity of the attack, but a short time.

The author's procedure in all patients in whom there is a suspicion of hyperplastic maxillary sinusitis is as follows: With the presence of any of the nasal changes which are often associated with the disease, a skiagram is first made before proceeding with the examination. If the skiagram shows the antrum to be cloudy and the nasal cavity is filled with polypi, the diagnosis is almost assured. A tentative diagnosis of hyperplasia of the sinus is made if a small amount of hyperplastic tissue is seen on the ethmoid floor or lateral wall of the nose, or if there is present a vasomotor disturbance of the inferior turbinate and the antrum appears cloudy.

The antrum is next irrigated through the normal orifice, or through an accessory opening if one is present. The washings are usually negative but occasionally large quantities of mucus and a little pus will be obtained. Lavage of the antrum is an important diagnostic measure when there is suppuration present, but it has scarcely any value in the type of disease under discussion. If the ostium of the antrum is large enough, a sound is then passed into the cavity and its walls probed, in order to ascertain the presence or absence of polypoid changes. In some cases the only true diagnostic procedure is a small pea-sized exploratory opening of the antrum made in the canine fossa. The author believes that this procedure is sufficiently simple to warrant making it a frequently used method in all cases where any doubt exists as to the condition of the cavity. If the antrum proves negative, the procedure can be stopped at this point; otherwise the radical operation is proceeded to.

The author makes an exploratory opening of the antrum in the presence of the following condition:

1. Nasal polyposis with or without a cloudy skiagram of the antrum.

2. Solitary nasal and retronasal polypi, when the pedicle can be traced to the region of the os maxillaris and the antrum skiagram is or is not cloudy.

3. As a preliminary step in an ethmoid operation when the skiagram shows a cloudy antrum.

4. Abundant postnasal discharge of long duration when other means have failed.

5. If, with lavage of the antrum, there is present—

(a) Flapping sound of polyp against the antral wall.

(b) Polypi in region of os maxillaris after lavage.

(c) When probing reveals hyperplastic changes.

6. In the absence of pathological changes of the nasal mucosa, when the patient complains of constant

fulness in the cheek and the skiagram of the antrum is cloudy.

[The observations made here coincide with our own. Advanced hyperplastic ethmoiditis usually is associated with marked shadows over the maxillary and often also over the frontal sinuses. The sinusitis, maxillary or frontal, in these cases is like the ethmoiditis, a non-suppurative affair. Subsequent infection may introduce a purulent element which may persist as a chronic purulent sinusitis. Hyperplastic ethmoiditis often exists with very few if any symptoms except the returning obstruction from the development of polyps. To remove an occasional obstructing polyp is all that one is justified in doing in these cases. In the same way the hyperplastic conditions of the maxillary or frontal sinuses, even when diagnosed along lines suggested by the author, does not necessarily indicate a condition that would be appreciably improved by operative interference. The recognition of this condition does not necessarily mean that the operation is justified.—Ed.]

Some of the Newer Methods of the *X*-Ray Examination of the Paranasal Sinuses, the Optic Canals, the Pharynx and Larynx. The researches of H. A. Goalwin[4] have led to the following detailed conclusions:

1. The complete *x*-ray examination of the sinuses requires at least seven roentgenograms: the lateral, postero-anterior, cephalodorsoventral, caudodorsoventral, axial, right and left optic canals.

2. Each sinus has a normal illumination which depends upon its depth, the density and thickness of its own walls and those of the skull. Before deciding upon the condition of a sinus the normal illumination to be expected should be estimated.

3. To make this estimate possible, a full lateral and full postero-anterior view should be taken.

4. The position of the head should always be *measured* by measuring the inclination of its principal

(4) Laryngoscope, April, 1926.

planes to the *x*-ray plate, using a protractor.

5. In case of doubt the illumination of the sinus should be *measured* by means of some form of photometer.

6. The roentgenologist should be thoroughly familiar with all the clinical and roentgenologic aspects of the disease and deformities of the head, and, needless to say, with the finest details of the anatomy of the head.

7. Great precaution is necessary in the roentgenography of the optic canals. The size of the focal spot of the tube should be measured. The distance of the focal spot from the plate and of the canal from the plate should be noted.

8. The size of the optic canal cannot be taken directy from the film. It must be calculated.

9. The roentgenologist's duty does not end when he makes a diagnosis. *He should furnish the clinician with all the anatomical data he can determine from his roentgenograms, which will help in treatment or operation.*

10. The *x*-ray examination can be of great service to the clinician in the diagnosis of diseases of the pharynx and larynx.

The author illustrates his technic with numerous roentgenograms and reports thirteen clinical cases.

[The author renders the interpretation of a plate a rather complex affair. As a matter of fact, the clinician learns to interpret a plate much more accurately than a roentgenologist because he has the opportunity to check up on his findings. One who has made a careful anatomical study of the nasal sinuses appreciates the impossibility of interpreting many variations in findings in terms of pathological lesions.—Ed.]

Intranasal and External Methods of Operating on the Ethmoid Cells: A Critical Consideration. In this article R. H. Skillern[5] discusses the advantages and

(5) Ann. Otol. Rhin. & Laryng., December, 1925.

disadvantages of the two methods. The author gives the following detailed experience which he believes is common to operators when performing the external operation:

"The external incision is made, and, as soon as the periosteum is reached, a profuse hemorrhage occurs which requires considerable time and trouble to control. The soft parts are retracted, and through this narrow wound the chisel is used to open the ethmoid through the lacrimal fosa, and more bleeding from the depths of the ethmoid, which continues during the entire operation, makes it difficult to keep the field free. The cells are now attacked and removed with suitable forceps, with an endeavor to keep close to the orbital plate and as high as possible, but away from the cribriform plate with its foramina. The exenteration is continued through a greater or lesser pool of blood, until the anterior sphenoid wall is reached. The debris is now removed together with any spicules of bone, the wound is closed, and a strip of gauze is inserted for drainage. The operator is finished, but he is by no means sure that all the cells have been adequately opened, particularly those lying in the anterosuperior external angle or where the so-called orbital ethmoid cells are always situated. After the gauze is removed, on the third or fourth day, and the wound allowed to close entirely, the after treatment is precisely the same as if the internal method had been followed. Now what is the difference in the results of the two procedures? None, if I may be permitted to answer the question, at least in my hands, for the internal route has given me quite as much satisfaction as the external, with certainly less of the trouble and anxiety that is connected with the latter."

The author believes that the external method as a primary operation has its place only with the following indications:

1. Pointing, or actual rupture externally.

2. In the event of orbital or cerebral complications.

As a secondary procedure, the indications are much more elastic, suited to the wishes of the individual operator; but should it be decided to perform the external operation, let it be done not by a mere opening and the haphazard removal of a few cells that lie within easy grasp of the forceps, but approached with the idea of exenterating the entire capsule from the foremost infundibular cell to the sphenoid area and from the fovea ethmoidalis to the lamina papyracea; for unless this is done the operator will subsequently find himself in the same predicament as if he had done an incomplete internal operation, except that in addition he will have burned his bridges behind him.

[An article of this sort helps to dispel the foolish idea which is in some minds, namely, that an external operation undertaken under ether where there is a good deal of bleeding is more radical and a more satisfactory procedure than an intranasal operation.—Ed.]

Optic Neuropathy and Sphenoethmoid Disease. C. M. Miller[6] reports three illustrative cases and concludes that:

1. The satisfaction in treating these cases will be greatly enhanced if the rhinologist himself will learn the use of the ophthalmoscope, not for the purpose of usurping the place of the ophthalmologist, but to follow more intelligently the progress of the case in all its details.

2. There is a class of cases of retrobulbar neuritis which seem never to progress to actual complete loss of vision or, at any rate, are very slow in their progress in this direction. These cases are never hopeless from the standpoint of restoration of vision as long as there is no picture shown by the ophthalmoscope of optic nerve atrophy.

3. The finding of one cause sufficient to account for the symptomatology does not justify us in ceasing to

(6) Laryngoscope, September, 1925.

search for all the causes that may be present, and remedy them all in our efforts to restore vision.

4. Where no other cause of an optic neuropathology is found after exhaustive physical, neurologic and serologic examinations have been made, exploratory operation on the ethmoid and sphenoid is justified in the hands of the competent operator.

[The author's contributions to this difficult problem are appreciated by rhinologists.—Ed.]

Exophthalmos a Complication of Nasal Sinusitis. According to C. F. Yerger,[7] exophthalmos due to nasal sinus disease is invariably unilateral, and the most frequent cause of unilateral exophthalmos is suppurative sinusitis. The most common orbital complication of sinusitis is orbital cellulitis and abscess, which is usually the result of frontal or ethmoid sinusitis, involving the former in adults and the latter in children. The records of the Illinois Eye and Ear Infirmary for the past ten years were examined to determine the incidence of suppurative sinusitis and orbital phlegmon and exophthalmos. There were recorded 357 cases of empyema of the accessory nasal sinuses, which were involved as follows: frontal, 45 per cent.; maxilliary, 28 per cent.; ethmoid, 24 per cent.; and sphenoid, 3 per cent. Of 150 cases of orbital phlegmon, 146 were recorded as orbital cellulitis and four as orbital abscess. There were 37 cases of exophthalmos recorded, but they were not classified as to etiology. Orbital phlegmons were four times, and empyemas of the nasal sinuses were ten times as frequent as exophthalmos.

The author gives a summary of seven cases of exophthalmos secondary to nasal sinus disease. The frontal sinus was involved in six cases, the ethmoid in five cases and the frontal, ethmoid and maxillary were involved coincidentally in three cases. There was one case of giant mucocele of the frontal sinus with absorption of the floor of the sinus from pressure necrosis.

(7) Am. J. Ophth., November, 1925.

There were three cases of acute sinusitis and four of chronic sinusitis. Pus was observed rhinoscopically in only one case. A supra-orbital swelling was present in four cases. Limitation of ocular movement was present in five cases, edema of the upper lid in five cases and chemosis in two cases. Ophthalmoscopic examination was negative. Four patients recovered and three died. Complications were meningitis, extradural abscess, sphenotemporal lobe abscess, frontal lobe abscess and serpens ulcer of the cornea.

The author mentions the anatomy and paths of infection, symptoms and differential diagnosis, prognosis and treatment. He feels that it is only by external exploration of the orbitofronto-ethmoid wall that pathologic changes can be definitely ascertained, and adequate drainage established for both the orbital cavity and the nasal sinuses. The Killian incision is the best for the orbitofrontal operation. All diseased tissues must be thoroughly removed, and free drainage should be established between the orbital cavity and nasal sinuses.

Headaches and Intranasal Surgery. Certain headaches may be caused by an abnormality or disease in the nose, and the well directed observations of such cases will usually result in a diagnosis.

It is unfortunate, according to H. I. Lillie,[8] that many patients are subjected to intranasal operations for the relief of headaches that are not due to intranasal cause. In this event new symptoms are added to the old, and the patient is far more uncomfortable than before operation. If, however, a definite causative lesion can be found within the nose, well directed intranasal operative interference will relieve the patient.

The attitude with regard to destructive intranasal operations is becoming more conservative and as our knowledge has increased concerning the various types of headache, it is easier to differentiate the causal fact-

(8) Surg. Gynec. Obst., July, 1926.

ors involved. The various types of migraine, or hemicrania, offer perhaps the greatest difficulty in the differential diagnosis. Many patients are observed who have been subjected to intranasal operative procedures for the relief of this type of headache without relief from symptoms.

Ordinarily, it may be said that headaches due to intranasal lesions occur daily at about the same time of day, or under the same conditions; they do not continue throughout the day. This is particularly true of disease within the paranasal sinuses. Headaches due to swelling of the nasal mucous membranes occur under environmental conditions which cause the membranes to swell and come in tight contact. In such a case, if shrinkage of the membranes during the headache causes complete relief from the symptoms, a rather definite diagnosis can be made. In many instances measures may be undertaken which will permanently relieve such a headache. Such measures may consist of correcting an abnormality of the nasal septum, even though the patient was conscious of no obstruction, and correcting an impaction of the middle turbinate from the middle meatus; crushing a large middle turbinate without removing it will occasionally relieve the symptoms. The impacted middle turbinate is usually associated with what has been called the vacuum frontal headache.

The various types of migraine headaches do not respond to such measures. These headaches do not occur daily, and there is a periodicity of occurence with intervals of freedom. The patient may associate the trouble with a gastric disturbance, which in reality may be but a part of the clinical picture. The history may have extended over a period of years and there may be a family tendency.

One would hardly expect to relieve headache due to an intracranial lesion, or a toxic condition by intranasal surgery. Cushing has called attention to this.

Many patients, however, have been subjected to intranasal operations for the relief of such headaches. The paranasal sinuses are perhaps the most frequently attacked, particularly the ethmoid cells, notwithstanding the fact that the most skilful rhinologist undertakes operations on the ethmoid cells with great caution. It would be quite impossible to determine when the ethmoid labyrinth has been completely exenterated. It may be expected that the scarring over of the remaining cells will derange the function, whatever it may be, and cause other symptoms.

Sluder has called attention to the headaches due to derangement of the function of the nasal ganglion. Operation is not always indicated in these cases; in fact, in certain cases, operative interference will aggravate the symptoms.

It is evident that before intranasal operative interference is resorted to for the relief of headache, the surgeon should be reasonably certain that the patient will be benefited by operation. Great care must be exercised in the choice of the patient for operation and in the selection of operation for the patient, if we hope to secure relief from headache through operative interference.

[This paper emphasizes a very palpable fact, namely, that it is a much more simple matter to carry out some operative work on the nasal cavities than to recognize the proper indications for such operations. Especially has rhinology suffered very much at the hands of men who have undertaken the responsibility of working in this field with no further preparation than the acquiring of a smattering of technic for operative work and who have had no proper training and no background in clinical experience for evaluating the findings or for recognizing proper indications for such operations. This kind of specialist should be deprecated. No more common abuse exists in rhinological work than these operations upon the nose, undertaken to relieve head-

aches which have nothing to do with nasal conditions. A headache of nasal origin is a rare and unusual affair where there palpably exists a sinusitis.—Ed.]

Investigations on the Development of the Sphenoidal Sinus. P. H. G. Van Gilse[9] states that the sphenoid sinus consists of two parts, the neosinus and the part situated directly behind the anterior wall, which the author has named the "palaio-sinus." The palaio-sinus develops very early in fetal life.

The nose is formed by an ingrowth of epithelium from the surface into the mesenchyme and the resulting cavity becomes connected with the mouth through the primitive choanae. The extension of the ingrowth beyond the posterier part of the primitive choanae is the origin of the palaio-sinus. In an embryo 50 mm. in length the nasal cavity is enclosed in a cartilaginous capsule, the posterior part of which becomes the sinus cupularis posterior or recessus. At a further stage the recessus ossifies, forming a bony capsule which surrounds the sinus on all sides. On the anterior wall of the recessus there then remains a narrow opening, the ostium of the later formed sphenoid sinus. Pneumatization begins only after the capsule and sphenoid have become fused.

In adult life the sphenoid always consists of two parts, the remains of the capsule and the true sinus. The pneumatization is performed by the subepithelial layer of mucous membrane covering the walls of the palaio-sinus. When secondary pneumatization is incomplete, a sinus within the sinus may be formed. This is situated so laterally that it may be mistaken for an ethmoid cell.

Absence of the sinus is rare, and a double sinus can occur only with malformation of the nose. A double opening in a sinus is due to some pathological condition.

The cessation of pneumatization is due to the pres-

(9) Laryng. & Otol., March, 1926.

ence of softer material such as remnants of cartilage or connective tissue. Irregularities of the sinus may be due to retardation of pneumatization by abnormal conditions of the bone, irregularities in fusion of the different parts (rickets), pathological conditions of the mucosa, or ozena.

The Use of Radium and *X*-Rays in the Treatment of Malignant Diseases of the Paranasal Sinuses. In a review of the literature, D. Quick[1] finds rather few favorable results in the treatment of adult types of malignant growths in the sinuses. This is not surprising when it is realized that surgical principles, as applied elsewhere, can rarely be applied in the treatment of accessory sinus growth. During the past few years, radium and *x*-ray have proven of value in dealing with this group of cases.

Of 100 cases treated between 1916 and the present time, all but 28 patients were beyond the hope of anything except palliative measures. In 7 of these 28 cases the eye was removed, and the antrum cleaned out from below. Of the total group, 56 patients are known to be dead; 22 have been lost track of and are therefore assumed to be dead; 7 cases are too recent to classify, and 15 present no clinical evidence of disease.

The duration of freedom from clinical evidence of disease in these 15 cases is as follows: 1 case 7 to 8 years, 1 case 4 to 5 years, 2 cases 3 to 4 years, 5 cases 2 to 3 years, 4 cases 1 to 2 years, and 2 cases 9 to 12 months.

Of the 7 cases with removal of the eye in addition to operation through the mouth, 2 patients are well after 2 years; 1 is well after nearly 2 years; 1 was recently treated, and 3 died.

In the group of 15 cases clinically free from disease, 11 were of carcinoma and 4 of sarcoma. The author has seen only 1 case of primary carcinoma of the

(1) Surg. Gynec. a Obst., April, 1926.

frontal sinus. This patient is now well 6 years after surgical exposure and radiation directly within the cavity.

One very unusual case of lymphosarcoma which had extended well into the antrum and orbit has remained well nearly 7 years following external radiation, removal of contents of orbit, antrum, and ethmoids, and intensive radiation within the cavity.

As a result of his experience the author concludes that:

1. Surgical exploration of the paranasal sinuses and biopsy should be resorted to earlier and more frequently so that earlier diagnosis of new-growth may be made.

2. With few exceptions, the principles applying to surgical removal of cancer in general cannot be carried out in dealing with growths in the paranasal sinuses.

3. Radium and *x*-rays are of value in treating this group of cases but, except in palliative procedures, must be used in conjunction with surgery.

4. Radium and *x*-rays may be depended upon to eradicate the tumor tissue if applied accurately and uniformly throughout the growth in sufficient dosage.

5. Surgery must be employed to provide exposure for radium application and adequate drainage.

6. The anatomical relations of the parts are such that infection is a much greater menace here than in new-growths in most other locations.

[The success of radium in reducing malignant growths in the nasal cavities is rather surprising. Usually, if there is a return of the annoying symptoms, radium will again afford relief. Our experience has been that eventually the outcome is fatal. Surgical measure, even when radically carried out, will very likely increase the suffering rather than palliate.—Ed.]

Combined Operative and Irradiation Treatment of Cancer of the Nose and Accessory Sinuses. W. Kles-

tadt and H. Martenstein[2] report upon 58 cases of malignancy of the nose and accessory sinuses seen during a period of fifteen years. Most of the patients were between 50 and 60 years of age. In 49 cases the neoplasm was a carcinoma and in 9 a sarcoma. More than half of the patients complained of coryza with nasal obstruction. In 36.2 per cent. polyps were found. Nasal polyps and internal nasal cancers both follow chronic irritation of the nasal mucosa. The antrum of Highmore and the anterior portion of the ethmoid bone always contain pus.

The treatment requires: (1) radical removal of the growth; (2) simultaneous radical operation on all the diseased accessory sinuses; (3) irradiation. Internal cancer occurs most frequently in the upper part of the nose. Therefore the best incision for exposure of the operative area is the Weber incision for resection of the maxilla, which is carried upward along the supra- The facial wall of the antrum of Highmore, the lateral orbital margin along the lines of the Killian incision. wall of the nose with the aperture, the anterior wall of the sphenoidal sinus, the orbital wall of the frontal sinus, and the mucosa of all the accessory sinuses are removed and the tumor masses curetted with a sharp curet. Of the hard palate, which is essential for nutrition and speech, no more is removed than is absolutely necessary. The dura and the structures of the pterygopalatine fasso are critical sites. The suture of the wound is confined to the eyebrow, the ala nasi, and the vestibule of the mouth, in order to leave a portal of entry for the subsequent irradiation.

Of the 58 cases, 38 were subjected to irradiation treatment consisting of roentgen or radium irradiation alone and in combination. Sixty-four operations were done on these 58 patients with a total mortality of 7.8 per cent. The dangers of the operation, anesthesia, hemorrhage and meningitis may be decreased by con-

(2) Beitr. Z. klin. Chir., 133, 1925.

duction anesthesia of the second branch of the trigeminal nerve and the ethmoidal nerve, injections around the blood vessels to secure anemia, and good drainage of the wound secretions.

Four of the patients may be considered as cured after freedom from recurrence for five years. One patient had a local recurrence after three and one-half years, and another after five and one-half years. The majority (53.5 per cent.) showed a recurrence within the first year. Metastases are not often observed, but when they occur they are found most frequently in the bones. The advisability of removing the lymph nodes is difficult to decide because of the rarity of metastases and the fact that recurrences are usually local. Since the glands serve as the recipients for the cancer cells mobilized during the operation, it seem wise to operate on them only after a few days.

With regard to irradiation treatment it is still undecided whether the administration of relatively small doses at intervals of several weeks over a long period of time or intensive irradiation is best. However, the failures of intensive irradiation according to the method of Wintz and the occasional serious roentgen injuries resulting from this method justify irradiation in fractional doses. The authors have obtained the best results with doses of one-third to two-thirds of the skin unit dose given with the use of a filter of 3 or 4 mm. of aluminum.

Suppuration of the Nasal Accessory Sinuses as a Portal of Entry of Infection in Diseases of the Heart. During the past five years W. Spielberg[2] has had the opportunity of examining and studying a very large group of cases at the clinics of the Beth Israel and the Midtown Hospitals and in private practice. The patients were studied carefully by clinical examinations, laboratory tests, *x*-ray and antroscopic examinations.

Practically every patient examined showed evidences

(2) Maine J. & Record, June 16, 1926.

of sinus infection in some form or another. Only very rarely could it be said with any degree of certainty that a case was absolutely free from a diseased process in the sinuses. In antrum infections particularly, where a direct inspection of the lining mucous membrane was made possible by means of the author's antroscope, he was able definitely to differentiate pathological from non-pathological conditions. By this aid all grades of polypoid degenerations were studied from the very early thickening to the advanced polypoid degeneration of the mucosa lining the sinus.

The *x*-ray examination was a great help in so far as deciding whether a sinus was diseased or not. A cloudy plate, however, was found to be no indication of the character of the lesion present. An acutely congested mucosa of an antrum gave a marked cloud on the *x*-ray plate, while extensive polypoid degeneration gave at times a slight diminution in the illumination, the latter depending on the amount of air present in the sinus and whether the natural opening was patent.

In spite, however, of the predominance of sinus disease, a frank or so-called closed empyema of a sinus was frequently found. Open or discharging empyemas were more frequently met with, but proportionately were also rather infrequent.

In its relation to cardiac disease it is interesting to note that the number of cardiacs found among the patients examined was very negligible. In his private practice the author collected only three cases of cardiac disease associated with sinus infection, where the latter appears to be directly associated with the cardiac pathology, and possibly the focus of infection causing the heart trouble. He has also collected a group of cases with empyema of one or more of the sinuses in the same person where there is not the slightest suggestion of heart disease present.

The liability of infection does not therefore appear to depend on the degree of involvement or the number

of sinuses involved, but on the virulence of the organism causing the infection, since certain bacteria are more prone to excite disease than others.

Sinus infections although widespread among children are rarely associated with rheumatic infection and endocarditis or other forms of heart disease. The same holds true with infections of the tonsils; although universal in childhood, they are only occasionally associated with heart disease. The same holds true also with many other infections which we carry about with us, without showing any manifestations of disease.

One is therefore inclined to reason that an infected sinus is but a link in the chain; the sinus harboring germs that will directly or indirectly cause a cardiac lesion, and in only a few presenting positive manifestations. Apparently we are still in the dark in determining the precise circumstances and pathways through which germs will travel and terminate in an infection of the heart in a given case.

Three illustrative cases are reported by the author.

[The author's observations that antrum disease in some form or other exists almost universally in patients examined would be analogous to saying that examinations of the nasal cavities disclose palpable evidence of some alterations which can be designated as pathological, or that the changes in tonsils in adults always indicate chronic tonsillitis. The impression might easily be gathered from expressions of this sort that all antra require treatment where there is systemic infection, or that all tonsils in adults should be removed, propositions which are obviously absurd. The author's conclusions that cardiac disturbance or other systemic infections rarely follow in the wake of sinusitis, even the suppurating form, are quite in keeping with our own observations.—Ed.]

Changes in the Nose and Nasal Accessory Cavities

in Myeloid Leukemia. H. Sternberg[3] reports two cases of myeloid leukemia with the nasal accessory cavities affected. The necropsy of the first patient, a woman, aged 33, confirmed the diagnosis. Frontal sections through the nose and the nasal accessory cavities showed that the lower and middle turbinates were much swollen and filled the lumen of the nose almost completely. The mucous membrane was pale yellow and showed fine granulations on the surface with numerous very minute hemorrhages. The mucous membrane of the septum was also irregularly swollen. The mucous membrane of the antrum of Highmore was very edematous, showing many hemorrhages. In both maxillary antrums, mucus and blood were found. The mucous membrane of the ethmoid cells, of the frontal and sphenoidal sinuses were more or less edematous and showed hemorrhages in spots.

The histologic examination of all parts of the mucous membrane of the nasal cavity showed a dense, diffuse infiltration with myelocytes through the whole thickness of the mucous membrane. This infiltration started just under the epithelium and reached the osseous and cartilaginous border respectively. The bones of the septum and the bony skeleton of the lower turbinates showed, on the lower surface, an irregular formation caused by the presence of very numerous larger or smaller Howships lacunae with typical giant cells. The same condition but less pronounced was also found in the osseous portion of the middle turbinates and the rest of the lateral nasal wall.

The mucous membrane of the accessory cavities showed a marked difference. Here the edema of the mucous membrane prevailed, but the infiltration was less pronounced. These infiltrations stood in direct connected with the leukemically changed bone marrow. The infiltration proceeded from the bone marrow and had penetrated into the mucous membrane of the ac-

(3) Ztschr. f. Hals-, Nasen- u. Ohrenh., 11: 371, 1925.

cessory cavities along the open marrow spaces and along the communicating vessels. Hemorrhages completed the pathologic picture. It also could be observed that leukemic infiltrations penetrated from the marrow spaces of the bones surrounding the sphenoidal cavities and ethmoid cells into the cranial cavity and the dura respectively, and toward the optic nerve.

The second patient was a woman, aged 55. The patient became sick four weeks before entering the hospital. She suffered from pain in her throat and swelling on both sides of the neck. The pain increased. Two weeks before examination punctiform hemorrhages appeared over the whole body. The patient noticed a disagreeable odor from her mouth. The rhinolaryngolic finding when the patient was admitted showed an ulcer the size of a pea, with greasy coating, above the right upper canine tooth. Punctiform hemorrhages were found on the oral mucous membrane and on the tonsils. An ulcer the size of a pea with greasy covering was found on the posterior wall of the pharynx. This wall showed a color like yellow wax, especially at the sides. There was a small shallow ulcer at the cartilaginous portion of the septum on the right side. The mucous membranes were pale. In the submaxillary region on both side masses of the lymph glands were present.

The diagnosis of myeloid leukemia was made. The patient died six days after admittance to the clinic. The necropsy revealed myeloid leukemia, a necrotizing pharyngitis and a colloid carcinoma of the stomach. The nasal accessory cavities showed a moderate edema of the maxillary antrums and the ethmoid cells, and a more pronounced edema with hemorrhages especially of the right sphenoidal cavity.

The Rôle of Ciliated Epithelium in Sinusitis. After taking up the anatomy of the mucous membrane of the nose, F. L. Phillips[4] discusses the results of A. L. Yates

(4) Ann. Otol. Rhinol. & Laryng., September, 1926.

on the activity of ciliary epithelium within the sinuses.

Stimulated by this work the author performed the following experiments on dogs:

The frontal sinuses of large dogs were laid open, and in one sinus a minute quantity of India ink was placed on the floor of the sinus. The ink was picked up by the cilia and moved for a short distance up the posterior wall toward the roof of the sinus. It then turned at almost a right angle and was propelled forward and downward toward the frontonasal duct, through which it finally disappeared. It was interesting to note the rapidity with which the cilia rid the sinus of the ink, it being perfectly easy to note the advancing line of the stain, and also that as the ink was carried along no trace of it remained to stain the mucous membrane. In forty-five minutes the advancing line had traveled to the frontonasal duct, and in two hours all the stain had disappeared.

The frontonasal duct on the opposite sinus was plugged with bone wax, and a larger quantity of ink introduced. The sinus was then closed. In three days, on opening the sinus again, practically the same amount of ink remained as when placed there.

Upon the application of a 5 per cent. cocain solution to the sinus membrane, the action of the cilia was retarded for a period of about thirty-five minutes, after which time the sinus was freed of stain as before.

Next, one frontal sinus was curetted, and the other used as a control. Stain was applied to both. After two days the stain was still to be seen in the curetted sinus, though the frontonasal duct was left open; the control was free from stain. It was the author's purpose to ascertain the time it would require for the ciliated epithelium to regenerate, if at all, after curettment, but he was unable to keep the animal alive long enough for this to take place.

An acute frontal sinusitis was now produced by the introduction of nonhemolytic streptococci; this condi-

tion was allowed to persist for two days. The sinus was then cleaned by washing with saline solution, and again the ink stain applied. There was still ciliary action but it was sluggish and delayed. As the sinusitis subsided the ciliary action become more normal.

From his observations, the author is thoroughly convinced that a healthy ciliated epithelium is a most important factor in maintaining a normal sinus condition, and treatment should be directed toward reestablishing this healthy condition in as short a time, and with as little derangement of the cilia, as possible.

Displacement Irrigation of Nasal Sinuses. The procedure used by A. W. Proetz[1] is as follows:

1. The patient is placed in the supine position, with his head projecting beyond the top of the treatment chair or table. The occipito-atloid joint is extended until the tip of the chin and the external auditory meati are in the same vertical plane. This renders the sphenoid sinus, with its ostium upturned, the most dependent structure in the nasal chamber. A "V" shaped pocket thus occurs at the junction of the face of the sphenoid with cribriform plate of the ethmoid.

2. The fluid to be introduced is now allowed to flow into the nostrils from a syringe and comes to rest in this pocket, submerging the ostia of the posterior sinuses. It does not enter the sinuses, as their ostia are of insufficient size to permit the escape of the contained air.

3. Gentle suction (not more than three pounds) is through its upturned ostium. On releasing the suction now applied intermittently to one nostril, the other being closed, the palate and tongue being held in the "K" position to seal the pharynx. Any of the ordinary vacuum appliances will suit, provided that the degree of tension can be controlled. When the suction is first applied, a bubble of air escapes from the sinuses this air is replaced by a drop of the overlying fluid. The

(1) Arch. Otolaryng., July, 1926.

process is repeated until the sinus is full; about a dozen alternations usually suffice to accomplish this.

4. The patient is returned to the erect position, and the fluid remains in situ for an indefinite period (eight hours to several days).

The author has treated thirty sinus cases in the above manner with sodium chlorid and has had good results in most of them. This method is not a substitute for surgical measures when the latter are indicated, nor is it a panacea for sinus cases in general. The treatments are given at intervals of three to eight days depending on the amount and character of the discharge.

There is a great field for diagnosis in that opaque solutions may be used and the sinuses *x*-rayed. The writer has been able in several obscure cases to make a diagnosis from the *x*-ray and confirm it at operation (Plates XXV, XXVI, XXVII and XXVIII).

Miscellaneous Nasal Conditions

The Atmospheric Factor in the Causation of Colds. It is the belief of W. A. Wells[4] that the atmosphere as a universal, inescapable environment has always had, and still has, profound influence on all life. For the utilization of this element in the life processes, the respiratory organs were developed. In the warm blooded animals there is a differentiation of function in these organs, in that the distal extremity (air cells) are concerned only with the chemical, the proximal (nasal erectile tissue) with the physical properties of the air.

An organ becomes sensitive to the elements or forces to which it is adapted, and, in consequence, is affected by alterations therein. The respiratory tract must therefore be affected by alterations in the atmospheric

(4) Ann. Otol. Rhin. & Laryng., March, 1926.

environment, and the nasal end of it especially affected by alterations in its physical properties.

That the nose, the most frequent site of colds should be especially affected by changes of temperature and moisture, coincides with the generally accepted view that these are the kinds of changes in the atmosphere which especially produce colds. The nose is concerned with these physical properties not only as an organ of respiration, but as an organ of heat-regulation in conjunction with the skin. On account of the latter function it is brought into close relationship through sympathetic connection with the skin, and this explains how it is readily affected by atmospheric impressions on the body surface.

Under ordinary circumstances, the nasal organs can adjust themselves to the variations in the physical properties of the atmosphere and perform their respiratory functions as a heat-regulating organ, but it must be adversely affected and suffer in the event of unusual and unnatural states, as extremes of heat and moisture, and especially in an unnatural relationship between temperature and humidity.

Prolonged low temperature, for example, is harmful because it gives no opportunity for wholesome reaction; excessive cold, because it paralyzes the mechanism of reaction; low temperature with very high humidity because the determination of blood is not then altogether consistent with physiologic function; drafts, because unnatural conditions then exist, which hamper the skin and the nasal organs in the performance of their functions and disturb the harmonious relation which should exist between them.

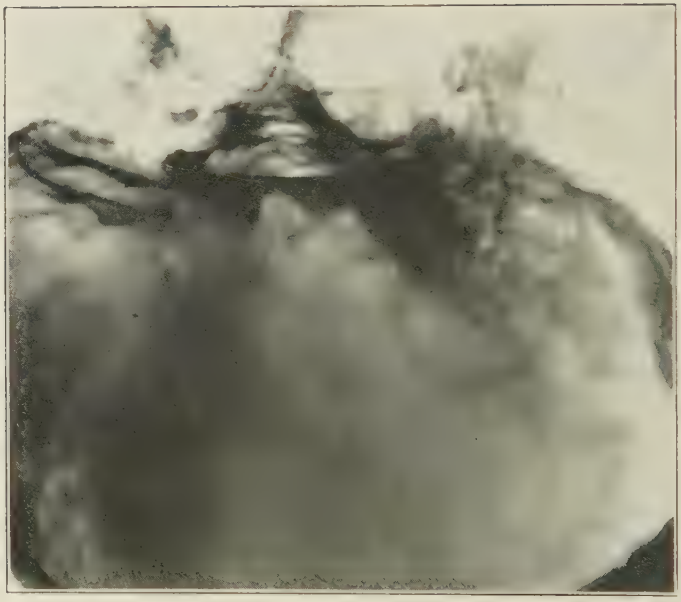
Treatments of Colds, Including the Abortive Treatment and Use of Vaccines. In his consideration of the vaccine treatment of the common cold, F. N. Sperry[5] concludes that it is of real value only if a definite focus of infection can be demonstrated. He discusses the

(5) Ann. Otol. Rhin. & Laryng., March, 1926.

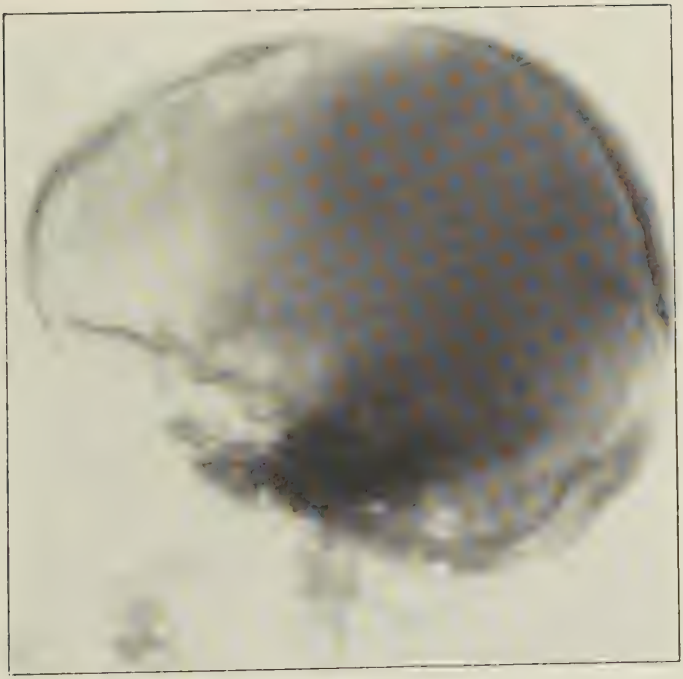
PLATE XXV.

Case 13. Oil introduced into nose, resting in nasal chamber. Suction has not yet been applied. Note absence of oil in the sphenoid.—Proetz, page 382.

PLATE XXVI.



Case 13, after application of intermittent suction. Oil is seen in sphenoid and posterior ethmoid cells. A few scattered drops may be seen remaining in the position seen in Plate XXV.—Proetz, page 382.



Case 13. 'Erect position' showing the oil in the posterior ethmoid and sphenoid cells.—Proetz, page 382.

PLATE XXVIII.

Case 14. Oil in sphenoid. The thin white line between the bone of the sella turcica and the oil indicates a thickened membrane as does the space on the right (floor of the sphenoidal cell). This was verified at operation. — Proetz, page 382.

types and dosage of various vaccines and describes d'Herelle's work with bacteriophage.

The most efficient method of abortion of a cold is by restoration of the normal nasal circulation, by diaphoresis, and by rest. The chlorin treatment is described with details as to its administration. The most efficacious medications are spirit of nitrous ether, camphorated tincture of opium, belladonna, hydriodic acid, acetyl salicylic acid, iodids and calcidin. Locally nasal drops containing menthol and camphor are useful with children, while adults are best treated by the use of epinephrin, cocain, argyrol or neosilvol, and saline irrigations. Nasal tampons of ichthyol and glycerin have some value.

The author concludes with a discussion of physiotherapy and electrotherapy, massage, and general hygienic and precautionary measures.

[Anyone who discovers a method for the prevention or, shall we say, the quick cure of the condition known as head cold would confer a boon on humanity. It is not only the inconvenience to the sufferer but the fact that so many serious complications can be traced to head colds, such as pneumonia, nephritis and the like. Like all self-limiting processes any form of treatment would seem to give results. The vogue which vaccine treatment has enjoyed seems to be dependent only on this factor. Chlorin treatment, when results have been carefully observed, does not seem to have been of any particular value.—Ed.]

Etiology of Deviated Septum. In a supplementary statement to his extensive study of the causes of nasal septum deviation, O. Hirsch[6] demonstrates another anatomic specimen to substantiate his former opinion. This is a skull of a new-born infant with bilateral cleft palate. The septum, with the premaxillae attached anteriorly, "hangs" freely from the roof of the nasal cavity; it possesses a marked deflection to one side.

(6) Monatschr. f. Ohrenh., 11: 1234, 1925.

He reiterates his theory, that a study of embryo skulls and skulls of new-born infants leads one to conclude that anomalies in shape and position of the nasal septum are not due to pressure exerted by any of the adjacent bones, but that the anomaly inherently exists in the septum anlage.

Atrophic Coryza Not Ozena, Due to a Possible Degeneration of the Sphenopalatine Ganglion. I. A. Souchet[7] reports a case of a woman, aged 38, who had not been able to smell for eighteen months, and who complained of having had a dry nose all her life. She had never had a bad odor from her nose, never had formation of crusts, and never had pus from the nose or throat. This statement was confirmed by her husband.

The rhinoscopic examination revealed an extreme degree of atrophy of the external walls. The inferior turbinals were hardly visible, while the middle and superior turbinals were reduced to a thin, gristly band. The nasal fossae were considerably enlarged, showing a pale and glistening mucous membrane. There were no ulcerations, crusts or purulent masses present. The nasopharynx was pale and varnished in appearance, with a lack of sensibility, which was also absent in the nose. There was entire absence of odor at the time of the examination. The annexed cavities of the nose were negative.

The patient's health was excellent, with no trouble such as tuberculosis or syphilis either hereditary or acquired, and no other member of her family had ever suffered from nasal disease. Her Wassermann reaction was negative.

Of 217 cases of atrophic rhinitis, this was the only one which showed no ozena. The author states that specialists divide this disease into two types, one attributed to a purely microbic origin, the other to an anatomic cause in an enlarged nasal fossa from a lesion

(7) Rev. de laryngol., 46: 757, 1925.

of the sphenopalatine system of nerves. He quotes Worm and Reverchon in saying "following a lesion of the trigemina and particularly of the sphenopalatine system, the mucous membrane may present lesions which in a symptomatic way resemble the clinical picture of ozena if not identified with it. All observations speak in favor of the trophic theory of ozena.

"Is it not logical to conclude that, in the beginning of this condition, the essential element may be secondary and intervening when a favorable site is prepared by a nervous trouble?"

The writer suggests that the presence of microbic toxins such as tuberculosis, syphilis or otherwise in the blood of the patient, which may be undiscovered in habitual examinations, may fix on the sphenopalatine system and may be the point of origin of the trophic troubles presented by the pituitary membrane.

Such lesions are comparable with the reports observed in muscular atrophy, troubles of the skin, and so forth which are consequent to an intoxication by poisonous microbes of nervous fibers of the trophic cells.

The absence of malodor and crusts, which give ozena its characteristic clinical aspect, seems to give proof in favor of the individualization of trophic trouble, and sustains the theory of the exogenic of the secretions which affect the unfortunate subject with ozena.

The author does not think our present knowledge quite sufficient to establish fixed reasons for this condition, but hints it may be due to poor hygiene during the early period of life.

The Pathogenesis of Ozena. G. Gradenigo[8] recalls that there are two predominant theories held in regard to the genesis of ozena: the pure infection theory, which admits solely the action of a definite infective micro-organism, and the constitutional-infection theory,

(8) Arch. ital. di otol., 36: 33-37, 1925.

which assumes, in addition to a specific infective agent, a constitutional predisposition to the disease.

The author advances and defends a third conception, which might be called the purely constitutional theory, since he holds hereditary predisposition to be the sole essential for the development of ozena and considers the bacterial flora of the nose as a merely accessory factor due to the peculiar conditions of environment, notwithstanding the fact that the nasal flora exercises the prevailing influence in determining the clinical picture of the disease. All too often we confuse the causative agent of a single symptom of a disease with the determining cause of the disease itself.

The constitutional predisposition to the disease is transmitted according to the principle of a mendelian recessive type and, as is true of other hereditary diseases, is aggravated by syphilis and tuberculosis in the ancestors of the subject. The theory of hereditary predisposition, without the intervention of a specific infective micro-organism, is in the closest accord with the results of clinical and bacteriologic research.

A Simple Nasal Suction Douche. The apparatus illustrated by A. T. Shekter[4] is intended for the home use of the patient; it is simple in its makeup and inexpensive. It does not depend for its operation upon overhead waterbag, water or electric pump. It is compact and does all that is expected of a negative pressure suction irrigator. All parts are made of noncorroding material easily taken apart and sterilized by boiling. Valves are large and so built as to prevent clogging from nasal discharges. The suction bulb is of a special make and by its thickness and rib construction will "draw" quickly when released. It will produce a sufficient negative pressure to draw up pus and infected matter from the nasal cavities and sinuses of the average case and at the same time draw up a column of irrigating fluid to wash these discharges away.

(4) Laryngoscope, August, 1926.

The nasal douche is made up as follows: (1) A glass nasal tip so constructed as to permit quick and direct return flow; (2) rubber tubing of two colors, white and red; (3) rubber bulb (especially constructed for negative pressure); (4) valves and end weight.

The procedure for its use is the same as for any negative pressure apparatus. Patient places end of

Figure 27.

white rubber tubing into irrigating fluid; the end of the red rubber tubing is placed in a waste basin or dish partly filled with water to cover the end valve.

By grasping the bulb, the nasal piece is placed into the nostril to be irrigated and the other nostril closed with the index finger of the free hand as shown in Fig.

27. Repeating the letter "K" and at the same time repeatedly squeezing the rubber bulb, a sufficient negative pressure is produced in the nasal cavities and sinuses to cause an evacuation of the discharge, which in turn is quickly washed away and sucked into the waste jar by the irrigating fluid drawn up. This action takes place in a milking-like intermittent manner.

The amount of negative pressure in the nose can be controlled by the frequency and force exerted on the rubber bulb and since the force of irrigation is never greater than the amount of this negative pressure there can be no danger of forcing infected material into the middle ears.

Tuberculoma of the Middle Nasal Meatus. W. Tonndorf[5] states that tuberculous disease processes in the nose are found primarily at the nasal septum, then at the floor of the nose and the lower turbinates. Only in rare cases is the process confined to the middle turbinate or to an accessory cavity. In the literature, only single analogous cases are reported. All emphasize the rarity of the occurrence.

The patient in question, a woman, aged 49, was sent to the clinic by a specialist who reported that he had removed a specimen from the left nostril, which resembled sarcoma. The patient, as well as her sister, suffered from ozena since they were 10 years old. A year ago following "influenza," much pus was secreted from the left nostril, which became obstructed. A specialist removed part of a tumor from each nostril. Each manipulation, even a simple examination, was accompanied by profuse bleeding.

The author found a tumor in the left nostril which was covered on its red raspberrylike surface with crusts, and bled easily when touched. A tumor, the size of a hen's egg, was removed. The peduncle was located under the middle turbinate. The histologic examination showed a fibroma covered with stratified

(5) Ztchr. f. Hals-, Nasen- u. Ohrenh., Jan. 18, 1926.

squamous epithelium. In its marginal zone, numerous tubercles were present, which contained numerous giant cells. These tubercles showed partly caseous degeneration. No history of tuberculosis could be found. On account of the possibility that the tumor originated from the maxillary antrum or the ethmoid cells, these cavities were opened. The maxillary antrum was small and formed a common cavity with ethmoid cells. The mucous membrane was examined histologically. It did not show any signs of tuberculosis. The necessity of removing a piece for microscopic examination is obvious. Guyot and others have reported cases in which malignant tumors were assumed to have been present when, in reality, the tumor was a tuberculoma.

Bacterial Flora of Nose and Throat in Health and Upper Respiratory Infection. In searching for the causative agent in respiratory disease the problem is seriously complicated by the fact that the nose and throat normally harbor a variety of bacteria, some constantly present and other more or less transient. Correct interpretation, therefore, of the importance of organisms found in respiratory disease is dependent upon comprehensive familiarity with the bacterial flora in health. As a preliminary investigation of the common cold, G. S. Shibley, F. M. Hanger, A. R. Dochez and Mills[6] studied the bacterial flora of the nose and throat of thirteen individuals for periods ranging from five to nine months. Aerobic and anaerobic cultures were made from the nose and throat infections weekly in health, and daily in the course of colds and throat infections.

The normal basic nasal flora included Staphylococcus albus, diphtheroids, and for certain persons, Staphylococcus aureus and citreus; occasional transients were Gram-negative cocci and nonhemolytic streptococci. The normal basic throat flora included gram-negative cocci, nonhemolytic streptococci, and for certain in-

(6) Proc. Soc. Exper. Biol. & Med., 22: 258, 1926.

dividuals large gram-positive cocci, B. pfeifferi, and diphtheroids; transients were Staphylococci albus, Staphylococcus aureus, hemolytic streptococci, Staphylococcus citreus and pneumococci. Certain socalled potential pathogens, such as hemolytic streptococci, Staphylococcus aureus, pneumococci and B. pfeifferi, were found both in the presence and absence of demonstrable untoward symptoms.

In the course of colds a number of changes from the normal were noted. In the nose there was a tendency toward scantiness of growth in the early cultures and the basic flora was decreased; in the throat the usual prominence of gram-negative cocci was less marked and there was a moderate increase in the prominence of nonhemolytic streptococci. In the nose hemolytic streptococci and B. pfeifferi showed increases which were due entirely to late secondary spread. In the throat Staphylococcus aureus, hemolytic streptococci and B. pfeifferi went up; in the case of the two former this was due to secondary spread. The increase of B. pfeifferi was due mainly to the fact that the organism was widespread, in normals as well, at the time of the investigation (late winter and spring). No bacteria were found in the first or in early cultures to which an etiologic rôle could be attributed. The authors believe that the socalled pathogens to which they have referred probably play a secondary rôle in the type of upper respiratory infection under investigation. Cultures taken during sore throats showed the expected increase, in the throat, of hemolytic streptococci (from 17 per cent. in normals to 56 per cent. during infections).

[The delusion that one can gain data by examination of surface cultures from the membranes of the throat or the tonsils in determining whether a patient has some chronic focus of infection seems still to be indulged in by a good many practitioners. Contributions such as this and the work which has previously been

done by T. J. Davis make clear how futile it is to make any conclusions from smears or cultures obtained from the surfaces of the tonsils or pharyngeal membranes. Ed.]

The Nasal Passages in Lobar Pneumonia. A Clinical and Bacteriological Study. The frequency of penumococcal infection of the paranasal cavities in lobar pneumonia was noted by Darling, when he demonstrated, at autopsy, acute inflammatory changes in one or more nasal sinuses in more than 90 per cent. of a series of pneumonia cases. As no data referable to clinical observation of the nasopharynx in pneumonia were found, A. R. Felty and C. A. Heatley[7] performed bacteriological examinations from the nasopharynges of 16 persons with lobar pneumonia. The cultures were taken by means of a swab applied to the middle meatus of each side of the nose. The material was injected into the peritoneal cavity of a mouse, and in certain cases cultures were grown on rabbits' blood-agar plates. The pneumococci were typed by agglutination, as were the pneumococci isolated from the sputum by the same method. Cultures, similarly procured from 11 patients who were not suffering from pneumonia at the time, and used as controls, yielded no pneumoccci in 9 instances. From the other 2, pneumococci (Type IV) was obtained; these patients had had a previous attack of penumonia caused by a pneumococcus of another type.

Of the 16 cases with lobar pneumonia, pneumococci of corresponding types to those found in the sputum were isolated from the middle fossae of the nose in every case. The nasal passages in 15 of these cases were examined with the nasopharyngoscope: of these, all showed hyperemia of the mucosa and 6 had signs of acute suppurative sinusitis. In 8 cases anteroposterior roentgenograms of the sinuses were made, in 7 of

(7) J. A. M. A., Apr. 17, 1926

which clouding of one of more of the sinuses were observed.

The authors discuss various other etiological and clinical phases of their subject and conclude by saying that "the series of cases here reported is too small to warrant the drawing of definite conclusions. The results are sufficiently striking, however, to encourage further investigation of this phase of the disease.

[Since lobar pneumonias are usually preceded by nasopharyngitis it would seem rational to expect that the causative organism could be recovered from the secretions of the nose even after local evidences of such rhinitis may have subsided. It seems also quite logical to expect that an organism virulent enough to produce lobar pneumonia when causing a rhinitis should be virulent enough to produce a severe enough sinusitis to be clinically diagnosable. Is it reasonable to say that because a sinusitis exists in association with a pneumonia that the pneumonia has caused the sinusitis or that the sinusitis has anything to do with the etiology of the pneumonia? Have they not both occurred independent of each other from the common source of infection—acute rhinitis?—Ed.]

Carotid Ligation in Epistaxis.. H. McKnight[9] reports a case of extreme epistaxis of traumatic origin requiring carotid ligation: first the external and then the common carotid arteries were ligated. Ten months later a marked thrill at the site of the ligation suggested that a certain amount of canalization of the clot had taken place.

Review of the literature in epistaxis reveals only two cases where common carotid ligation alone was done. Seventeen cases are found where external carotid ligation alone was done. All cases show successful results, except in one case of double common carotid ligation in inoperable sarcoma.

It would appear that an attempt should be made

(9) Texas State J. Med., August, 1926.

first to control hemorrhage by ligating the external carotid artery, and should this not be successful, the common carotid can then be ligated.

External carotid ligation should always be as far away from the bifurcation as possible, because of danger of brain emboli and to allow accessory blood supply to the brain in case it becomes necessary to ligate the common carotid artery.

Diseases of the Mouth

Cysts in the Floor of the Mouth. According to O. J. Stein,[9] there are quite a variety of these cysts, including ranula, dermoid, thyroglossal, branchial, multilocular, mucous and echinococcus.

Although the term ranula is applied by many to a large variety of cysts, including the parotid and even the pancreatic duct, its definition should be confined to a degenerative cyst formation of the salivary glands in the sublingual region. Its histopathology shows it to be the result of a degenerative process of a salivary gland. Its chronicity, the absence of a mechanical obstruction of its orifices, its tendency to recur and its usual position to one side of the frenum help to differentiate it.

Hygromas that result from the occlusion of the ducts or orifices of mucous glands found in this region of the mouth—as the glandula incisiva, the gland of Blandin-Nuhn, beneath the tip of the tongue. Fleischmann's bursa, and so forth, have a different pathology. These cysts are in the mucous membrane, while ranulae are beneath the mucous membrane. The wall of the mucous cyst is lined with epithelium and contrains lymph structures. They are true retention cysts, usually the size of a pea or bean, and occur single or multiple in any part of the mucous membrane of the mouth.

A condition described as acute ranula is occasionally seen. It occurs rather suddenly, probably while mas-

(9) Ann. Otol. Rhin. & Laryng., December, 1925.

ticating. There is sudden pain and the appearance of a swelling under the tongue. The flow of saliva called forth by the act of mastication is suddenly checked by an obstruction to the salivary gland, usually by a small calculus or fish bone, or other foreign substance.

In regard to the treament of ranula, the author favors the external neck incision, but when the oral method is followed, the following procedure is advised: Linear incision of mucous membrane only; careful dissection of same from the sac as far as possible without puncturing; placing a fine wire in a snare holder around the remainder, removing as much of the cyst as possible. After thorough toilet, the remaining cyst wall may be sutured to the mucous membrane edges.

Cysts of the mucous gland more readily respond to the incision or resection method per os than do ranulae, although total incision is at times the only permanent relief.

The epithelial lined cysts include the mucous, dermoid, thyroglossal, colli congenita and the multilocular or adamantinoma. Some of these are simple retention cysts resulting from a closure of the duct's orifice or obstruction within the duct. Some are inclusion cysts resulting from trauma. Others are congenital in origin, as fetal inclusions in foreign soil or fetal rests derived from embryologic clefts, fissures and ducts.

Dermoids commence shortly after birth, but on account of their slow and painless growth attract little attention until early youth or adolescence, unless there should be interference with nursing. They project into the floor of the mouth or into the neck behind the chin or both places. At times they attain the size of an orange. Only rarely is there deformity of the skin and mucous membrane coverings are healthy and normal. They have a pale yellowish cast, feel soft, smooth and elastic, globular in appearance and centrally located. Their lining membrane consists of con-

nective tissue, squamous or pavement epithelium, sebaceous glands, hair follicles and even sweat glands. Those of epiblastic origin may contain sebaceous substance, hair, epithelial cells and cholesterin. Those originating from hypoblasm contain mucoid fluid and have a connective tissue lining membrane containing cubical and columnar epithelium.

Thyroglossal cyst must be differentiated from a sublingual dermoid, an abscess of a suprahyoid lymph gland, a suppurating infrahyoid bursa and from accessory thyroid substance. The ingestion of food has been observed to create an increase in the amount of discharge from a fistula or an increase in the size of the cyst. On protrusion of the tongue the cyst is pulled upward, receding as the tongue is withdrawn.

Under colli congenital or branchial fistulae one understands an embryologic deficiency of development in the neck, the result of a persistent cervical sinus. They show themselves in three places, along the outer side of the neck, anywhere from the mastoid tip down to the head of the sternum. The other two places are in the throat, in the region of the tonsil and in the region of the sinus pyriformis. Where the branchial cleft closes, both internally and externally, but an intermediate portion remains unobliterated, the lining epithelium may proliferate and by other changes create a cyst. These cysts usually occupy the submaxillary region and rarely involve the floor of the mouth. Occasionally such a cyst may grow so as to encroach upon the floor of the mouth from below the mandible, as was shown in a patient who came under the author's observation.

The multilocular cyst of the jawbone is one of the least frequent of all. It is known as cystic adenoma or adamantinoma. It is easily confused with sarcoma, although benign in nature. Malassez describes it originating as epithelial rests derived during fetal life from (1) mucous membrane of the jaw, (2) from

epithelial cord of enamel organ. (3) from epithelial membrane of enamel organ. It encroaches on the floor of the mouth by an extension inward from the mandible. It can scarcely be confused in diagnosis with any other variety of cysts found in the mouth. First, because of the deformity of the jaw; second, because it is integral with the jaw itself and hence immovable, and third, because of its firm bony feel.

The echinococcus cyst, although of common occurence elsewhere in the body, only rarely is found in the mouth. It presents as a chronic cystic enlargement, causing mechanical inconvenience alone, and no pain, unless it should become infected and suppurate. When in the mouth it is usually of the tongue.

Harelip and Cleft Palate. This paper is based on a study of 400 cases of harelip and cleft palate operated on in private practice and in the surgical wards of the Children's Hospital, Boston, by W. E. Ladd[1] and a review of 262 cases of operation by other members of the surgical staff of the Children's Hospital.

The author has found that 55 per cent. of the cases occur on the left side, 29 per cent. on the right side and 16 per cent. double.

From a review of the opinions of the various writers it is seen that there is not general agreement as to the choice of age for operation or whether the lip or palate should be done first. It seems to the author that there are perfectly logical reasons for the decision as to which operation should have priority and for the selection of time at which it should be done. The restoration of the alveolar line is obviously an essential for an adequate operation on the lip. The first procedure, therefore, is to push the intermaxillary bone into its proper position. The younger the patient the easier it is to accomplish this. As a practical matter it rarely means that the operation can be done much before the third week. On account of the difficulty of

(1) Boston M. & S. J., June 3, 1926.

transporting the mother and infant to the hospital it is only occasionally that the operation may be done earlier. The lip is repaired at the same time that the intermaxillary bone is put in line. As Blair states, the reason for this is to restore nasal breathing and also to relieve the anguish of the mother.

Of more importance than either of these is to obviate the necessity of leaving silver wire imbedded in the bone for a long period of time. At the time of this operation the mucous membrane of the edges of the very front end of the cleft may be elevated and approximated with one or two stitches.

The operation can be very easily done up to the third or fourth month but there is nothing to be gained by waiting this long and the chance of the infant not thriving is sufficiently great to make it undesirable to wait. After five or six months the voma maxillae and the intermaxillary bone become ossified so that molding of them is difficult and from that time on operation becomes increasingly complicated. It can of course be done at any age.

The time of choice for the palate operation is from eighteen months to two years. The reasons for this selection are that up to this time one gains a certain amount of narrowing of the cleft, both from the first operation and from the growth of the parts. It is at a time before the child has made much effort at speech and consequently they begin talking with a restored palate. If one delays the operation longer the child widens the cleft in the soft palate by his efforts to talk. If one operates much earlier the full benefit of growth is not obtained.

The writer gives in detail his technic of single and double harelip, and cleft palate operations. Numerous diagrams and illustrations are presented.

As to results, the author states that his mortality for the harelip operation has been 2.2 per cent. One per cent. of the cases were partial failures, 6 per cent.

were fair, and in 93 per cent. the cosmetic results were deemed satisfactory. The mortality for the palate operation was 3 per cent. In this series there were 88 per cent. good results, 4.5 per cent. of cases required secondary operation to close some small hole, and 3 per cent. required a complete secondary operation.

In conclusion, the author strongly advocates careful speech training following these operative procedures.

Cancer of the Mouth: The Results of Treatment by Operation and Radiation. From a study of 276 cases, C. S. Simmons[4] arrives at the following conclusions:

1. Cancer of the buccal mucosa is a rapidly growing form of carcinoma and is often incurable in a few months from the onset of the disease.

2. In primary cases without clinical evidence of metastases surgical treatment offers 35 per cent. chances of permanent cure as against 15 per cent. by radiation treatment.

3. In primary cases with clinical evidence of metastases, radiation treatment offers no chance of permanent cure and radical surgical treatment not over 5 per cent.

4. The degree of malignancy varies somewhat as to the situation, cancer of the cheek and upper jaw being less malignant than cancer of the tongue or floor of the mouth. This is probably due to the fact that the papillary type is more common in the former positions.

5. In the early cases, comparatively little reliance as to metastases can be placed on the presence or absence of palpable glands.

6. Of the primary cases dying of a recurrence of the disease, life is prolonged by treatment, but the patient lives longer following operative treatment than following radiation treatment.

7. In recurrent cases dying of the disease, in all groups, life is longer in the cases which received radia-

(4) Surg. Gynec. Obst., September, 1926.

tion treatment than in those cases receiving no treatment.

8. A certain group of cases which may be said to have been "cured" by treatment are prone to develop a second cancer at some point in the buccal mucosa.

9. The results of treatment depend more on the amount of differentiation of the cells, as determined by the microscopic examination of the specimen, than on any other one factor.

Radon (Radium Emanation) as a Palliative Agent in the Treatment of Intra-Oral Cancer. F. E. Simpson and R. E. Flesher[5] hold that, as regards intra-oral cancer, distinctly operable cases should receive the benefits of surgery, whereas all other cases should be treated by radon. The operable lesions are those that are small, well localized, easily accessible and do not involve any important anatomic structure. Inoperable cases show large, ill defined and inaccessible lesions, such as those involving the base of the tongue, the pharynx, the palate and the tonsil.

Radon is a gas and is extracted from an aqueous solution of radium chlorid by a special apparatus. At least 1.5 gm. of radium element should be contained in the solution used for this purpose. The rays that are emitted by a tube of radon are identical with those that are given off by a tube containing radium. Differing from radium, however, radon quickly decays, losing 16 per cent. of its power every twenty-four hours. Some of the advantages of radon over radium itself are:

1. A large dose (1,000 or more mc.) can be concentrated over a small lesion. This is of the greatest practical importance because it allows one to shorten the time of exposure. A short exposure with a large quantity of radon is essential to success.

2. Bare glass tubes containing radon may be introduced directly into tumor tissue. In certain cases, this

(5) J. A. M. A., Aug. 28, 1926.

procedure is of great value and may even be necessary for success, as in tongue cancer.

3. If a radon tube is lost it is not a calamity, as it has little or no intrinsic value.

The authors report on their treatment of 56 unselected cases. None of the cases could be regarded as being favorable for operation. In each instance the clinical diagnosis was confirmed microscopically.

Age and Sex.—The ages ranged from 29 to 71, the average age being 58.7 years. There were 52 men and 4 women.

Duration of Disease.—The disease was said to have existed for periods of from one month to three years, the average duration being 5.3 months.

Site of the Lesion.—The location of the disease was as follows: tongue, 9 cases; floor of mouth, 3; buccal mucous membrane, 17; superior maxilla, 8; inferior maxilla, 7 and palate and tonsil, 12. Cancer of the lip and cancer of the bone are not included in this report.

Lymphatic Involvement.—In 29 cases there were palpable lymph nodes in the neck. In 23 cases, the submaxillary nodes and in 4 cases the cervical nodes were apparently affected. One patient had palpable submaxilliary and submental nodes. In one case, there were palpable submental and cervical nodes. In 27 cases, no definite nodes could be detected.

Results.—Thirty-nine of the 56 cases have been carefully traced. Of these, 21 patients had definite palpable lymph nodes at the time of treatment. In 8 cases no nodes were found.

Patients with Nodes.—Of the 21 patients with nodes, two are living, one having been well for over five years, and the other for over four years. Of the 19 patients with nodes who have died, the majority were improved for a time. The duration of life after treatment varied from four months to three years, the average duration being 16.4 months.

Patients Without Nodes.—Of the 18 patients without

nodes, 14, of 77.8 per cent., are living; 4 have been well for more than five years; 5 for more than four years; 5 for more than three years. Four patients are dead. Three lived for more than three years after treatment, but all died eventually of recurrence of the disease.

Results in Cancer of the Tongue.—Of the 9 patients with tongue cancer, 6 had palpable nodes in the neck. Two of these are living. Of the 3 patients without nodes, 2 are living. The 4 living patients with tongue cancer have been well for five years; four years; three and one-half years and three years, respectively. Of the 5 patients who died, two were free of cancer at the time of their death, one having been well for more than four and one-half years, and the other for more than one and one-half years. Three patients received only temporary benefit.

General Results.—Assuming that the 17 untraced patients are dead, the total mortality among 56 unlected patients is 36, or 63.3 per cent.

Twenty patients, 35.7 per cent., have been well for periods of from three to five years, the average duration of freedom from symptoms of cancer being three years and nine months.

The Treatment of Carcinoma of the Tongue. Epidermoid carcinoma of the tongue is one of the most difficult types of malignant disease to treat because of the muscularity of the tongue, its rich blood and lymph supply, and its mobility, the age of the patient, and the presence of mixed oral infection.

As surgery has not been particularly encouraging, even when an almost perfect technic has been used, radium and the *x*-rays have been employed in the hope of improving the results.

For the primary lesion, D. Quick[9] recommends preliminary external radiation with the *x*-rays or radium packs to inhibit the growth of the lesion and prevent the implantation of tumor cells in normal tissue.

(6) Brit. J. Radiol., March, 1926.

Strict regard should be paid to oral hygiene. The author introduces into the lesion bare tubes 3 by 0.3 mm. in size and containing 1 mc. which gives 132 mc.-hrs. of radium energy in about a fortnight. To prevent the irritative and painful destructive effects of the beta radiation, he now employs gold capillary tubes. The tubes produce a painful reaction for from four to eight weeks, but their use is justified by the end-results.

If the patient is unable to withstand the radical treatment described, milder forms of radiation are combined with surgery. Only one cycle is given. If this proves insufficient, the prognosis is decidedly unfavorable. If an extensive slough seems imminent, the external carotid artery is ligated with the lingual and facial arteries under local anesthesia.

Operative measures are advocated also for cancer developing on syphilitic glossitis.

In the treatment of cervical lymph nodes the author prefers intensive preliminary radiation followed by surgery. He subjects every case immediately to heavy external radiation over both sides of the neck, preferably with radium, or if this is economically impossible, with the *x*-ray. If no evidence of invasion is noted, a second radiation is given as soon as the skin will stand it. As the *x*-rays act especially on connective tissue and radium acts especially on capillary blood vessels, the combination of the two produce a more uniform and generalized reaction than either alone. When a node is firm but movable, a radium pack is added, a complete unilateral surgical dissection is done, and bare tubes are buried especially where lymph channels have been severed. If the node is fixed, surgical dissection is rarely done as the capsule has been perforated. Under such circumstances it is wiser to use external radiation alone or to follow with surgical exposure and direct implantation of bare tubes.

Of 414 patients treated by the author, slightly over

20 per cent. were rendered clinically free from the disease and a considerable number were relieved even though their lives were not saved. In these cases, which were unselected, the percentage of clinical cures was approximately the same as that obtained by surgery in selected cases. The author regards the *x*-rays and radium as valuable additions to surgery rather than as substitutes for it.

Adenoma of the Tongue. G. Bolognesi[7], who records an illustrative case, comes to the following conclusions: (1) Adenoma of the tongue is a very rare occurrence. (2) In the present state of our knowledge it is impossible to explain the rarity of this tumor, which originates from definite groups of mucous glands in the tongue, in contrast with the relative frequency of carcinoma of the tongue, which is constituted by embryonic elements. (3) Most of the cases described have occurred in the male sex. (4) The tumor may be found at the base of the tongue, the sides, the lower surface, or towards the tip. (5) The condition is most frequent in young persons. (6) Adenoma of the tongue is a benign affection of slow growth, and in only exceptional cases does it grow to a size sufficient to cause mechanical disturbance of respiration, mastication, and deglutition. (7) Malignant degeneration is uncommon, being rarer than in adenomata situated elsewhere. (8) In structure the tumor is a tubular, follicular, or acinous adenoma. (9) Clinically adenoma of the tongue is a round or ovoid tumor, of moderate size, definite outline, of soft and elastic consistence, nodular surface, and freely movable beneath the mucous membrane of the tongue and on the sublingual muscular plane. (10) The differential diagnosis is comparatively easy: adenoma is distinguished from fibroma and lipoma chiefly by its consistence, surface, color, and evolution, and from lingual goiter, which is situated at the base of the tongue and gives rise to serious symptoms.

(7) Studium, Mar. 20, 1926.

Cure of Noma with Copper Sulphate. Kaspar[8] claims to have cured a case of noma by the simple use of a solution of copper sulphate. He was lead to test this remedy because in his bacteriological work he found that it arrested the growth of Vincent's fusiform bacillus, now recognized as at least one cause of this dread disease. The 10 per cent. aqueous solution is used. Application of this solution to the gangrenous area of the cheek was followed in the author's case by the formation of a line of demarcation announcing that the disease process had been arrested. The author regards the Vincent fusiform bacillus acting alone as the cause of but one type of noma.

In other cases the symbiosis of this organism with a spirochete appears to be the cause, and in this type the author fears that the copper solution might not cure as it has no power over the spirochete. Under these conditions he would add salvarsan locally and intravenously and would expect a cure. Salvarsan in turn has no power over the fusiform bacillus. The latter when it occurs in noma has an astonishing polymorphism and its simulation of other pathogenic bacteria has probable led to reckoning some of these as able to cause the disease. As a matter of fact it is by no means unlikely that quite different organisms can produce the same gangrenous affection in the poorly nourished children who contract it.

The author's patient chanced to be an adult, which is an extremely rare coincidence, for of 413 cases collected by Bruns only 11 were individuals over 15 years of age. In the author's case the two others quoted by him, also in adults and both fatal, the noma followed the extraction of a tooth. The mortality of the disease in the past has reached 80 per cent., but recent cases are showing an improvement on this figure.

(8) Wien. klin. Wochschr., May 6, 1926.

The Tonsils

What is Wrong with the Tonsil Operation? It is believed by F. T. Hill[2] that the popularity of the tonsil operation, and the too frequent and universal performance of the same is, in itself, the main cause of subsequent unsatisfactory results.

This is sometimes due to faulty operative technic, often at the hands of untrained operators and resulting in incomplete removal, disregard of other elements of Waldeyer's Ring, post-operative distortion and untoward complications.

Hasty and incorrect diagnosis accounts for much dissatisfaction. Disregard of questions of hygiene, or diet; inaccurate histories and insufficient general study of each case, with due attention to other possible sources of troubles, are frequently the causes of disappointment.

The time of operation is of greatest importance, especially in cases of severe systemic disability.

Careful study of each case with utilization of the best available consulting aid will remedy most of these difficulties.

[The author is quite right in calling attention to the modern tendency of indiscriminate tonsillectomy. On the other hand, the development of persistent annoyance after a properly executed tonsillectomy when the indications for removal exist, is not so uncommon and is quite another matter. It is not feasible to control the matter of scar formation in tonsil fossae and sometimes no doubt annoying symptoms result from contraction of scar tissue in this region. A not infrequent postoperative throat symptom is the development of a lateral pharyngitis which tends to perpetuate the acute attacks which resemble quite closely those of ordinary tonsillitis.—Ed.]

(2) J. Maine M. A., January, 1926.

Pathologico-Anatomic Findings in Clinical Lacunar Tonsillitis. B. Grossman and R. Walapfel[3] state that sections of tonsils removed during the acute attack of lacunar tonsillitis show that the inflammatory process is not limited to the cryptic region, but that the infiltration and destructive process associated with streptococci and gram-positive diplococci extend throughout the tonsil tissues. (Incidentally, the subjects suffered no ill effects from tonsil removal during the acute attack.)

[The fact that inflammatory changes are not restricted to the surface of the tonsils nor to the lining of the lacunae show how inadequate local application is for the cure of acute infection. The danger of systemic infection is greater when the operation for removal of tonsils is undertaken in the presence of an acute tonsillitis. Because one observer has experienced no such sequelae means that every case that is operated on in an unfavorable condition results in some untoward complication. The proper time to remove tonsils is between attacks.—Ed.]

Chronic Tonsillitis at Various Ages. At the New York Post-Graduate Hospital, it is a rule that every tonsil removed be sent to the laboratory for microscopic examination. This rule is rigidly adhered to, thus enabling J. I. Berlin[4] to compile and tabulate from a series of cases as follows:

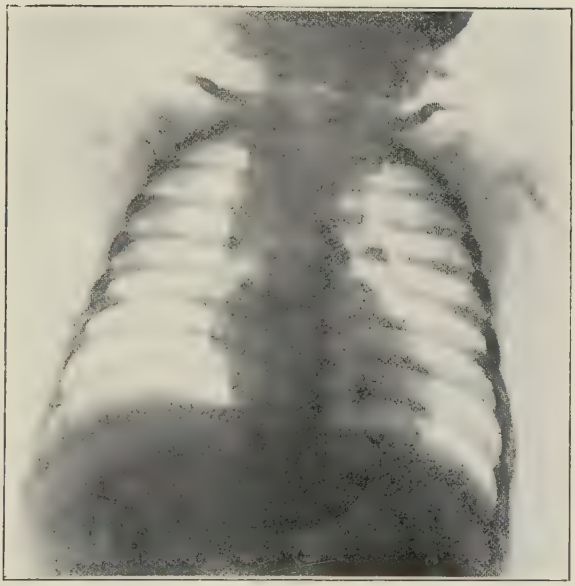
Total number of cases.....733

Simple hypertrophy..607 Chronic hypertrophy.. 126. Divided as follows:

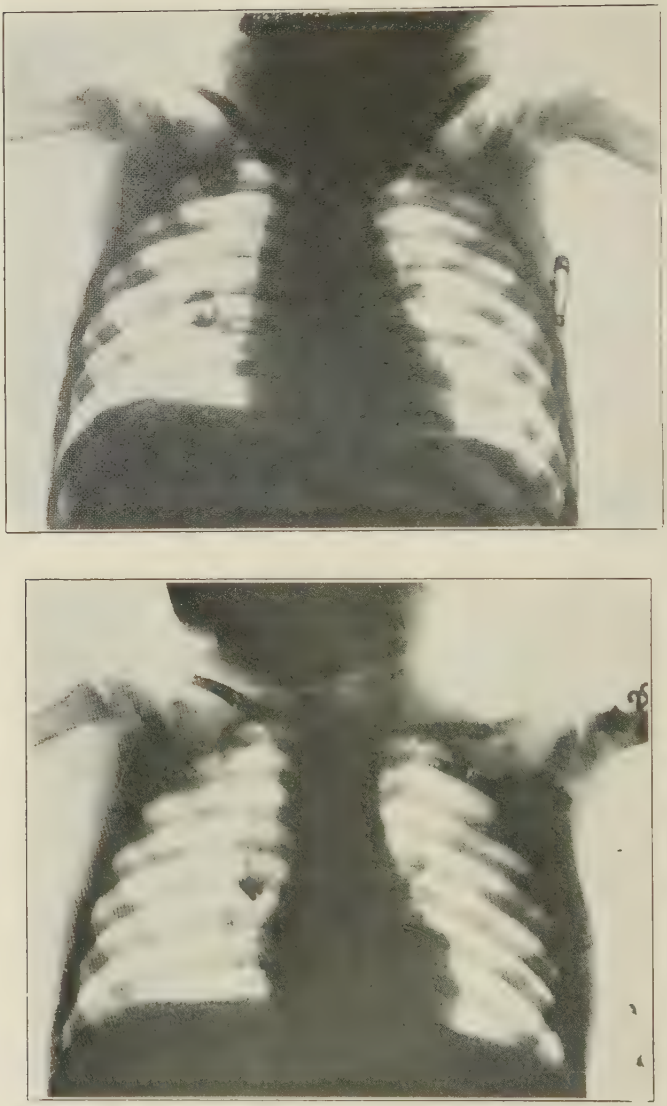
Age	Simple	Chronic	Per cent. Chronic
1 to 3	88	4	.043
4 to 7	262	25	.087
8 to 10	101	12	.106
11 to 15	123	34	.216
16 to 19	30	10	.25
20 to 25	2	23	.92
26 to 30	1	9	.90

(3) Ztschr. f. Hals—, Nasen— u. Ohrenh., 12:323, 1925.
(4) Laryngoscope, December. 1925.

PLATE XXIX.



X-ray of a baby two months old who had an open safety pin, point up, lodged in the beginning of the esophagus. The attempt to close and remove the pin failed and the pin was pushed into the stomach. Following the manipulations there was emphysema of the right side of the neck. The plate was taken at this time. It shows that the air descended in the mediastinum and pushed the thymus free from the heart. It shows further that the great vessels play no part in the shadow cast by the base of the thymus.—Mosher, Macmillan, and Motley, page 409.



A—X-ray of a child with an enlarged thymus.
B—X-ray of the same child shown above after the thymus had been re-reduced in size by x-ray treatment.—Mosher, Macmillan and Motley, page 409.

31 to 39	0	6	1.00
40 to 50	0	3	1.00

The number of chronic tonsils at an age as early as one year is of interest, as well as the steady increase in percentage of chronic tonsils agreeing with the increase in age.

In the above group six cases of cartilage in the capsule or at the base, was also noted.

In reviewing the pathological reports of these 733 patients whose tonsils have been removed, the writer found that the number of cases in which the pathologist reported chronic tonsils among children was surprising. A further tabulation of the above group as to sex, showed that beginning at four years and upwards, the female was the greater sufferer of chronic tonsils, while between the ages of one to three years the male sufferers were greater in number.

[We would suggest that it is not such a simple matter to determine the differentiation between what the author terms simple and chronic tonsillitis. According to his table, the diagnosis of chronic tonsillitis seems to be dependent upon the duration of the process. At what stage in the hypertrophy of tonsils should one say we have to deal with simple hypertrophy and at what stage does the situation warrant the diagnosis of chronic tonsillitis? In our opinion any tonsil appreciably enlarged represents a chronic tonsillitis, for the chief manifestation is hypertrophy. This is the type usually encountered in children. In adults we usually meet another form of chronic tonsillitis where the tonsils are shrunken. This may or may not have been preceded by the hypertrophic form.—Ed.]

A Clinical and Preoperative Study of the Thymus in Children of the Tonsil and Adenoid Age. According to H. P. Mosher, A. S. Macmillan, and F. E. Motley[5], a series of nearly five thousand consecutive (4820) *x*-

(5) Laryngoscope, January, 1926.

rays shows that 7 per cent. of children in the tonsil and adenoid age—namely, 2 years to 16—have an enlarged thymus. The statement that 50 per cent. of children have enlarged tubercular glands which give a broad mediastinal shadow indistinguishable from the shadow given by an enlarged thymus is not correct. A series of ninety *x*-rays at the Peabody Home for Crippled Children—a tubercular sanitorium—showed a broad mediastinal shadow in 7 per cent.

The crying of a child during the taking of an *x*-ray plate does not enlarge the size of the thymus.

Blood counts made on the children shown by the *x*-ray to have an enlarged thymus gave a slight lymphocytosis, but it was not enough to be diagnostic. After *x*-ray therapy of the thymus there was no change in the blood count.

Comparing percussion with the *x*-ray as a means of finding an enlarged thymus, percussion was successful in 25 per cent. of the cases submitted to both methods of examination.

The thymus, like a tonsil, is a lymphatic gland. In status lymphaticus the thymus is enlarged in series with the enlargement of the lymphoid tissue of the alimentary tract—namely, Peyer's Patches—the solitary follicles and the mesenteric glands. It has not yet been proven that the thymus has a specific function.

A thymic death is remarkably like a death from acidosis. Theoretically a thymic death could be explained as due to some fault in the chemistry of the alimentary tract—recurring acidosis, or histamin poisoning, which would make posible a sudden and overwhelming toxemia, the explosion being touched off, so to speak, by chemical or nervous causes—the administration of an anesthetic or a severe fright. Conditions in the alimentary tract have to be "just right" to be "touched off." The generalized enlargement of the lymphoid structures of the alimentary canal is the

protective response to a recurring invasion of toxins. Since an enlarged thymus is the only available hint that a generalized enlargement of the lymphatic structures of the alimentary tract may exist as well, since this is the only pathological finding at autopsy in status lymphaticus, since deaths from status lymphaticus are more commonly associated with the tonsils and adenoid operation because it is the most common operation in children, it seems a wise precaution owing to our present lack of knowledge of this condition which can express itself so tragically, to learn the size of the thymus and if it is enlarged to reduce it to normal size by the therapeutic use of *x*-ray before undertaking the tonsil and adenoid operation, in fact before performing any surgical operation on infants and children.

This procedure to be logical means at least a passive adherence to the older theory that an enlarged thymus is pathological and that it contributes some deleterious substance to the body, and that when the thymus is reduced to normal size this does not occur. This belief has never been proven. The present trend of investigation seems to be against this theory. Those who hold that the thymus is simply a large lymphatic gland believe also that the 7 per cent. of enlarged thymuses found in the 5,000 cases is only a normal per cent. of variation. They hold further that the enlarged thymus and the enlarged lymphoid tissue of the alimentary canal in status lymphaticus are of little or of no significance. The author has a good deal of sympathy with the view that the thymus is simply a lymphatic gland. He feels, however, that its enenlargement, associated with a generalized enlargement of the lymphoid structures of the alimentary canal does mean something. As one of those held finally responsible when a status lymphaticus death occurs in the hospital, the author will continue to act on the older theory and advise the continuance of the

routine *x*-ray of the chests of children and the *x*-ray treatment of an enlarged thymus when found.

One cannot say that any one thymus is abnormally large unless it weighs fully 42 gm., or too small unless it weighs less than 8 gm. The diagnosis of an enlarged thymus is based upon the shadow above the heart, continuous with it and extending beyond the shadow cast by the borders of the dorsal spine. X-ray treatment was used in all cases and all patients were operated on safely. (Plates XXIX and XXX).

Tonsillectomy by Propulsion and Avulsion. In this method J. B. Horgan[6] uses a modified Ballegenger type of reversed-action tonsillectome. In order to achieve a total enucleation in all cases, it is necessary to make sure that the blade of the tonsillectome is of the requisite bluntness, that this blade cuts well home on to a leaded groove, that one obtains a massive, but not necessarily an extra-capsular hold of the tonsil, and that the latter is finally *avulsed* from its bed and not cut from it.

The forefinger of the disengaged hand is used to depress the tongue and bring the tonsil into view. The ring of the instrument having encircled the tonsil, the latter is lifted forwards above the alveolar eminence of the lower jaw, the thumb or forefinger of the disengaged hand being used to apply counter-pressure through the anterior faucial pillar. At the termination of this movement, and before the blade is made to close, the shaft of the instrument should lie obliquely across the patient's mouth, making an angle of about 45 degrees with the horizontal, in which position its handle should come to lie about level of the patient's opposite shoulder. A firm hold of the tonsil having been obtained and retained, the final or avulsive movement is initiated as soon as the handle of the instrument has been brought back to its primary position. It is a remarkable fact that the tonsil so held and

(6) Practitioner, August, 1925.

pulled upon will almost invariably peel cleanly from its bed and not break away. The avulsion is best carried out by a series of very sharp tugs during which the operator's two hands are locked around the handle of the instrument. A great and seemingly alarming amount of traction is often requisite to attain the end in view. The anesthetist, who stands at the head of the table, must be advised of this maneuver, so that he may exert steady counter-pressure with both hands which, in this manner, retain the head in its horizontal position. The time occupied in removing each tonsil varies from five to ten seconds.

The author believes that by this method a complete enucleation of any variety of tonsil may be obtained, and also that the avulsion of the vessels effectively prevents primary or secondary hemorrhage.

The Therapeutic and Prophylactic Value of Tonsillectomy in the Active Stage of Vincent's Angina. A study of fifteen cases here reported by S. B. Westlake[7] suggests the following:

1. An active severe Vincent's angina is no contraindication to tonsillectomy.
2. Relief from the symptoms follows the tonsillectomy.
3. No recurrence has been observed.
4. The tonsil must be an important factor in the chronicity and recurrence of the disease.
5. The spirilla and fusiform bacilli associated with the disease almost instantly disappear after operation.
6. No satisfactory explanation of this rapid disappearance has been found.
7. This work may open up a new field for the study of the etiology of Vincent's angina.

Post-Tonsillectomic Pulmonary Abscess. C. Jackson[8] is convinced that pulmonary abscess following tonsillectomy has been present in the past, and that

(7) Ann. Otol., Rhin., & Laryng., December, 1925.
(8) Atlantic M. J., February, 1926.

the apparent absence of these cases formerly was due to the fact that they were overlooked. It is impossible, even yet, to make even an approximately accurate estimate of the frequency of the condition. From many statistical sources similar to the foregoing, it is evident that, while tonsillectomy is one of the most frequent causes of pulmonary suppuration, its occurrence is rare relative to the number of tonsillectomies done.

Route of Infection.—There are three possible routes of infection: (1) the bronchi, (2) the lymph channels, and (3) the blood vessels.

It seems probable that each of these routes is traversed in respective cases of post-tonsillectomic pulmonary abscess, but the relative frequency of travel by each route has not yet been determined. It is not impossible that two or even all three routes may be traveled in one case, as might occur when an infective agent reaching a bronchus has penetrated the epithelium. Once this barrier is passed, the blood and lymph channels are reached and a relatively remote parenchymal focus might result.

From a study of the cases observed at the Bronchoscopic clinic, the author concludes that:

1. Pulmonary suppuration, usually localized as an abscess, is one of the most serious complications to be considered as a possibility in advising tonsillectomy. It calls urgently for study by the pediatrician as well as by the operator.

2. Its occurence is so rare, relatively to the number of tonsillectomies done, that it should not be regarded as a contraindication when tonsillectomy is indicated; but the presence of certain conditions may render postponement of tonsillectomy advisable.

3. As indications for postponement of tonsillectomy, the following may be sugested, to be modified as deemed best in the particular case:

(a) The presence of, or convalescence from an acute, subacute, or curable infectious disease of the

upper or lower air passages. This category includes acute or subacute rhinitis, nasopharyngitis, laryngitis, tracheitis, bronchitis, tonsillitis, and many other conditions for the prophylaxis of which a tonsillectomy is frequently advisable. Decision as to the best time for an interval operation must be decided in the individual case. The matter of temporary immunity, secondary infections, and other things are to be considered.

(b) Influenza, including all epidemic forms of acute infective inflammatory disorders affecting the air passages (in some individuals, other regions), would render postponement advisable except for urgent reasons.

4. Clincal evidence obtained by many observers, and laboratory study by Fetterolf and Fox, have established the fact that there are two classes of cases in post-tonsillectomic pulmonary suppurations:

(a) Those starting endobronchially and due to infection, either inspirated at operation, or present in the bronchi before operation.

(b) Those starting in the parenchyma of the lung and due to infection carried by infective agents in the lymph stream, or in the blood stream as in an infarct-producing embolus.

5. Every patient on whom tonsillectomy is done should be closely watched for at least a month after the operation.

6. The slightest cough or other sign of bronchial irritation or pulmonary trouble should place the patient in the class of impending pulmonary abscess until proven otherwise.

7. The roentgen ray is a most important diagnostic means, and is especially called for in every case to exclude the presence of tooth, fragment of instrument, or other foreign body in the lung.

8. Treatment should be under the care of the in-

ternist or pediatrician, with the surgeon and the roentgenologist as consultants.

9. In bronchoscopic aspiration we have a valuable addition to our methods of treatment. It is the most direct method of treating post-tonsillectomic lung suppuration. It should not be used to the exclusion of treatment by the pediatrician or internist, in any case; nor should it be used in cases in which the pediatrician, the internist, and the surgeon think external operation is indicated.

End-Results of Tonsillectomies and Adenoidectomies. D. H. Anthony[9] sent a questionnaire to 373 postoperative patients and 220 were returned. From this data the author has compiled some interesting charts:

Table 1

Types of Tonsils.

	Operated	Improved	Relieved	Same	Worse
Deep Tonsils	120	21	95	3	1
Pedunculated Tonsils	91	39	52	0	0
Secondary Tonsils	9	2	7	0	0

Table 2

Throat

	Same	Relieved	Improved	Worse
Recurrent Acute Tonsillitis	6	120	9	1
Recurrent Acute Pharyngitis	4	0	1	0
Peritonsillar Abscess	0	9	0	0
Chronic Tonsillitis	1	15	1	0
Vincent's Angina	0	6	0	0
Enlarged Cervical Glands	2	15	10	1
Chronic Laryngitis	1	2	0	0

Table 3

Ear

	Same	Relieved	Improved	Worse
O. M. P. C.	4	10	1	0
O. M. P. A. (recurrent)	0	18	0	0
Deafness	10	0	3	1

(9) J. Tennessee M. A., January, 1926.

Tinnitus	2	0	3	0
Vertigo	2	0	0	0
Chronic Mastoditis	1	1	2	0

Table 4

Eye

	Same	Relieved	Improved	Worse
Optic Neuritis	0	2	0	0
Vitreous Opacities	2	0	0	0
Retrabulbar Optic Neuritis	0	2	0	0
Corneal Ulcer (recurrent)	0	2	0	0

Table 5

Nose

	Same	Relieved	Improved	Worse
Recurrent Acute Rhinitis	0	4	5	0
Chronic Antrum	3	0	2	0
Chronic Ethmoiditis	6	3	0	0
Sub-acute Ethmoiditis	0	10	0	0

Table 6

Miscellaneous Cases

	Same	Relieved	Improved	Worse
Chorea	0	0	1	0
Chronic Gastritis	0	8	0	0
Pyelitis	1	6	0	0
Rheumatism	3	11	4	0
Dermatitis	0	2	0	0
Under Weight	1	10	4	0
High Blood Pressure	2	5	2	0
Neuritis	0	0	1	0
Acute Nephritis	0	3	0	0
Goiter	0	0	3	0
T. B. Cervical Glands	0	0	1	0
Recurrent Acute Bronchitis	1	2	0	0

In answer to the question as to improved health, 192 found their general condition better than before operation. The results as regards complications were:

Total number of delayed hemorrhages within first twenty-four hours	4
Total number of secondary hemorrhages between fifth and eight day	5
Total number of lung abscesses after general anesthesia	1
Total number of acute retro-pharyngeal abscesses after local anesthesia	1

From the above data the author believes that when the tonsil and adenoid is found sufficiently diseased and operation indicated the age is a minor factor as in any other modern surgical operation.

The submerged tonsil which causes the greatest amount of systemic absorption is found more often in the adult, which type of patient receives greater benefit from a tonsillectomy.

A well done adenoid and tonsil operation in children lessens to a marked degree acute infection of the accessory nasal sinuses and middle ear infection. The large percentage of relieved and improved chief complaints of postoperative adeno-tonsillectomies is very satisfactory.

End-Results of Tonsillectomy. In this interesting paper T. J. Harris[1] states that a questionnaire was sent to a thousand leading laryngologists, inquiring particulars of all suits threatened or begun in connection with the tonsil operation. Nearly 300 replies were received. From a study of this mass of date the author deducts the following:

1. The number of malpractice cases, in the Eastern states at least, does not appear to be at all in proportion to the total number of tonsil operations. If such suits are common, they must be settled privately and are not known either to the state society legal representatives or to medical men generally. Reply after reply of those received professed never to have heard of such cases. In line with this is the statement of the New York representative of one of the great medical defense companies to the effect that in a period covering many years and many thousands of risks he did not recall more than 25 cases dependent on the tonsil operation coming to his office. Not more than ten came to trial, and all were decided in favor of the defendant. The remaining fifteen were dropped or settled out of court for a small amount. The chief ground

(1) J. A. M. A., Mar. 20, 1926.

for action was cicatricial contractions in the throat following the operation.

2. The actual number undoubtly is on the increase. This is due in part to the greatly increased number of operations and in part to the incompetence of the operator.

3. The bringing of such suits is dependent in most instances on injudicious criticism of brother practitioners or on efforts of commercial lawyers.

4. Almost every conceivable ground for action has been employed, but not one of these per se renders the operator liable to action. All depend on the single question, Did he exercise reasonable care and skill in the operation and proper after-care? Lung abscess, of which there were five cases; postoperative hemorrhage, of which there were seven; removal of the uvula, of which there were sixteen, even death itself, of which there were thirty-one, is not to be regarded as by itself sufficient to render the operator liable.

The surgeon must constantly recognize his potential liability and take every precaution to avoid every possible ground for action. He is at liberty to operate wherever he may choose, but it cannot be too emphatically stated that the operation is a capital one and one that except under exceptional conditions never should be performed in the office but always in a suitably equipped hospital, the patient to remain at least one night after the operation. The author is aware of the usual reasons urged in favor of operation in the office. None of them, however, is sufficient to warrant taking the risk which it entails.

Even when performed in a hospital, a poor result will not prevent a surgeon from being held liable for damages if it can be shown that it was due to the lack of reasonable care, although public hospitals themselves, *i. e.*, hospitals not chartered for gain, cannot be held liable for anything occurring in connection with an operation, provided it is performed by a surgeon whose

competence it has inquired into and satisfied itself of, in advance of the operation. The surgeon-in-chief, when present, is responsible for all acts occuring in the operating room, whether of an assistant or nurse. If he is not present he is not responsible for what takes place in the operating room. In that case the assistant surgeon performing the operation is responsible.

Far and away more common than other ground for action, indeed, equal to all others combined, is want of ordinary and reasonable care, leading to a bad result.

To establish the connection of not exercising reasonable care is not an easy matter and undoubtedly is the reason why so many suits threatened or begun were discontinued. This requires the testimony of an expert witness, and few medical men of repute are willing thus to injure a brother practitioner's reputation, especially as there are often extenuating circumstances in connection with the operation of which they personally are unaware, and which may be accountable for any bad result that may have taken place.

Twenty-four of the entire number of the 124 cases were settled privately, almost all on advice of counsel because of the recognized faulty surgery including removal of the uvula, that had been done. As every one who has had a large experience in tonsil work is aware, the removal of the uvula is not an uncommon occurrence. The author has never seen a case in which the uvula alone has been removed or even the tonsillar pillars wounded or removed, in which he could recognize any evil consequences. Indeed, years ago, it was a common practice to remove the uvula for certain catarrhal symptoms. The cases in question for the most part involved much more than injury to the uvula and pillars. There was a history of extensive adhesions shutting off partially or completely the naso-pharynx. It is difficult or impossible to explain such traumas except through gross incompetence. There exists

no law prescribing who shall perform the tonsil operation and, apart from the impossibility of enforcing such a law, it would be unwise to urge it. The same result, however, can be secured in another way. The rhinologists of the country should constitute themselves a body to educate the public in the importance of the tonsil operation and the necessity of its being properly performed. When thus educated, the public will put itself in the hands of those who are competent to perform the operation.

The largest single step in this direction recently has been taken by the organizing of the American Board of Otolaryngology, composed of representatives of the four national societies specializing in those subjects, who are authorized to pass on the qualifications of each candidate and, when satisfied of his competence, give him a certificate of approval. In the short time that it has been in existence, one year, 600 have received such certificates. It is the confident hope of those interested in the elevation of the standard of otolaryngology in this country that within a short time every one entitled to the certificate will have made application for it and received it. A general support of this movement by the members of the four national societies of similar societies throughout the country, such as the Section of Laryngology of the New York Academy of Medicine, by applying promptly for the certificate of the board and displaying it in the office, will do more than all else to discourage and shut out the six week "tonsillectomist" whose only claim to recognition is the sign in his window advertising him as an ear, nose and throat specialist. The example of the members of this section in applying for the certificate will have a large influence in bringing this about.

In spite of the fortunate experience of most of us in never having been annoyed by a malpractice suit, it is possible for this to occur to any one even after

the greatest care in the operation has been exercised. This is the experience of several of those whose cases have been reported in the foregoing. The defense work done by the several state societies is deserving of the heartiest commendation, as well as the importance of every surgeon taking advantage of the protection afforded by suitable liability insurance, preferably underwritten as it is in New York state by the state medical society itself.

[If the grounds for malpractice were extended to include failure to recognize the proper indications for operative interference the result would be a discouragement of the modern tendency for indiscriminate tonsillectomies carried out at the hands of general practitioners whose sole preparation in special fields is the acquiring of a little technic. It is much easier to teach one how to operate on the throat or the nose than it is to teach him how to recognize the proper indication for operation.—Ed.]

Results of Tonsil Operations. F. J. Pratt[9] sent out 200 questionnaires to physicians throughout the United States. Answers were received from 146, and in reviewing the answers to these questions, several interesting facts are brought out.

First, physicians, as a rule, are not very close observers of the after results of their work, or do not find out the reasons for their poor end-results.

Second, in answering questions they do not confine themselves to the subject.

Third, so far as results go, the tonsil operation, in many cases, is not satisfactory. True, the patient is rid of his repeated sore throat or focal infection, but in their place are often added new and different symptoms hard to relieve.

Fourth, even the most careful operator and the most perfect operation often leave after symptoms that are unexplainable.

(9) Arch. Otolaryng., August, 1926.

Fifth, the predisposition of the patient as to scarring and his ability to readjust himself is an important factor.

Sixth, there is a great question in the minds of most men on the amount of tissue to remove at the base of the tongue at the time of operation.

Seventh, most men believe adenoids are likely to recur in children operated on before the fifth year.

Eighth, the after treatment and duration of time of healing is quite universal.

Ninth, that, on the whole, the good results obtained more than offset any occasional bad symptoms.

Tenth, that a physician should try not to express an opinion on a throat with an apparently bad result until he has made a very careful and exhaustive study of that particular case.

Eleventh, the anatomic variations in the pillars, on which subject the author wrote a paper in 1924, should be remembered. One must not be misled in what is really only an apparent deformity.

Twelfth, that a tonsil operation should be classed as a more major operation. If it were, physicians would be more careful as to their training before attempting it.

Mixed Salivary Tumor in the Tonsillar Region. A. O. Freedman[1] reports the case of a soldier, aged 34, in whom there was a swelling in the region of the right tonsil, simulating peritonsillar abscess. Incision had failed to reveal and pus, so that the author dissected into the tissue which proved to be an encapsulated tumor connected at its posterior pole with the parotid gland. Pathologically the tumor proved to be a mixed salivary tumor. The author comments on the anatomical factors in cases of this type and briefly reviews the literature. He concludes that:

1. Mixed salivary tumors of the parotid may mi-

(1) Arch. Otoloryng., July, 1926.

grate to the inner side of the lower jaw and come to lie inside the oral cavity.

2. This migration may be explained by the persistence of aberrant embryonic sprouts from the primitive parotid tube.

3. The complex nature and the many peculiarities of the tissues which enter to form this type of tumor may be explained by its embryonic origin from mesoblast and epiblast.

4. From a pathologic point of view, the present case is interesting and rather rare because of the many types of tissues it contained (myxomatous tissue, cartilage, osteoid and fat). The majority of mixed salivary tumors contain only a few types of cells.

5. Clinically, the case demonstrates the advisability of checking up by microscopic examination the roentgen-ray findings of tumors which appear to invade bone, and vice versa. A grave surgical error would have been committed if the first roentgenogram had been relied on and a diagnosis of sarcoma of the lower jaw made.

6. Although this type of tumor is of slow growth, does not invade regional lymph nodes, and does not metastasize at a distance, it is advisable to follow up even total removal of the tumor by the application of the gamma rays of radium to prevent the 45 per cent. possibility of local recurrence.

The Radical Cure of Peritonsillar Abscess. Anatomic and pathologic study and clinical observation has convinced H. L. Baum[2] that pus is present in peritonsillar abscess long before it can be evacuated in the customary way.

Tonsillectomy evacuates this pus and provides massive drainage of the infected area. By the time pus has formed, local infiltration and systemic immunity make tonsillectomy for drainage safer than futile incision or waiting.

(2) Ann. Otol. Rhinol. Laryng., June, 1926.

Patient H. H., white, male, Jewish, age 55 years. Pemphigus beginning on left tonsil, later involving other tonsil, pharynx, gums, tongue and bucal mucosa, at which time picture was made. Duration of condition, three months. -Dintenfass and Greenbaum, page 429.

The operation gives immediate relief from suffering and, at the same time, performs the additional service of removing the offending tonsil.

[Most surgeons would see a serious objection to operative removal of the tonsils in the presence of a peritonsillar phlegmon. It would seem that the risk of serious systemic infection from stirring up the inflamed area cannot be ignored. To aply such local measures of relief as are available until the acute process subsides and then to resort to enucleation of the tonsils seems a more logical procedure. To remove a tonsil, seat of peritonsillar abscess, by local anesthesia is a much more difficult procedure than when there is no local inflammation to interfere with obtaining the proper anesthesia. A general anesthesia for work of this kind is palpably not reasonable when one considers the unquestionable risk of producing serious infection by operating on an inflamed area and the additional difficulties of the anesthesia, local or general. Most surgeons will prefer to postpone removing the tonsils until after the inflammation subsides. There is a type of surgeon who is always willing to do something bizarre. This type will naturally be attracted to undertake operations under peculiar circumstances.—Ed.]

Abscess of the Parotid Gland Following Acute Membranous Tonsillitis. A. Lobell[3] reports the case of a woman, aged 44, who complained of an acute tonsillitis. Subsequently the parotid gland on the left side became swollen and pus collections occurred behind and in front of the ear. These were drained and after a time the wounds healed entirely, but with some deformity.

The author discusses the condition as follows:

1. A streptococcic tonsillitis was the immediate cause of a suppurative parotitis. The bacteria obtained from the tonsils and from the gland were identical.

2. This complication resulted in a prolonged illness and a permanent deformity.

(3) Med. J. & Record, July 21, 1926.

3. Drainage through the duct is unreliable. Multiple abscesses are likely to be formed on account of the lobular arrangement of the gland. While there may be some communication between the individual abscesses, perfect drainage is not to be expected through such channels. Each collection of pus will require a separate incision.

4. The question arises, did the infection travel through the duct or lymph and blood channels? One may be inclined to think that an ascending infection through the duct is the most logical way. There are, however, points against this assumption. If infection through the duct were favorable, this complication would take place more often because tonsillar infections occur so frequently. Besides, there are other sources of infection in this vicinity, namely, pus coming from the nasal sinuses through the nasopharyngeal route, pyorrheal and dental infections. Foci of infection within the thoracic and abdominal cavities are more frequently cause of suppurative parotitis and the blood carries the infective material to the gland in these instances.

5. The infrequent occurrence of suppurative parotitis as a result of throat infections is well illustrated in a report of 54 cases by Blair and Padgett of Chicago in the Archives of Surgery, July 1923. In this large series, only four cases were due to various throat conditions.

Gum Versus Gargles in Post-Tonsillectomy Treatment. The customary home treatment prescribed following tonsillectomy consists in the use of a gargle of either warm normal salt solution, some of the pleasantly flavored proprietary antiseptic washes, weak solutions of peroxid of hydrogen, potassium permanganate, or the like. The diet is often left to the discretion of the patient, with perhaps instruction that it be soft in nature. Some surgeons will still advise liquids

throughout the healing period, fearing that solid food will cause secondary hemorrhage.

It is the rule to find some degree of infection during the healing on tonsillectomy wounds. In the majority of cases the tonsillar fossae become covered with a thick white membrane, which as it undergoes bacterial decomposition becomes extremely offensive in odor. Systemic absorption of toxins from the putrefying mass takes place directly through the wounds, and from the alimentary tract, since a considerable amount of the toxin is swallowed.

A loss of from five to twelve pounds in weight during the healing period is common, at the end of which time the patient, though the throat is no longer painful, is but convalescent from the period of toxemia to which he has been subjected, and must devote further time to the recovery of that state of health which existed prior to the operation.

According to W. H. Spencer[4] the results of the substitution of chewing gum for the gargle in post-tonsillectomy treatment will be a revelation to those who will try it. The attrition of chewing keeps the tongue and teeth clean. Chewing stimulates the secretion of saliva, which, being swallowed, laves constantly the wounded surfaces and lubricates the pharyngeal mucosa. The attrition of swallowing keeps down the membrane formation to a minimum, so that the usual white patches covering the tonsillar fossae, which have often been mistaken for diphtheritic membranes, are in some cases entirely absent. The fossae being free from infection, the breath never becomes offensive, and for the same reason secondary hemorrhage is less likely to occur. None of the toxic symptoms are seen in such cases, though some reaction from the shock of operation and the local trauma is to be expected.

The use of the muscles of mastication in the chewing lessens the stiffness of the jaws and the tongue, while

(4) Therap. Gaz., Feb. 15, 1926.

frequent swallowing keeps the muscles of deglutition supple. Pain in the throat is thus much alleviated. Since the throat is less sore, and the toxic symptoms are lacking, the appetite at no time fails, and the patient readily complies wtih instructions to continue his regular diet. Well masticated solid food is more easily swallowed than liquids. It maintains a high level of nutrition, promotes a state of well-being, and hastens the reparative processes. The swallowing of solid food is in itself a potent factor in keeping the mouth and throat clean, a fact that is readily demonstrated in the coated tongues and foul mouths of fasting patients to be seen in every medical ward.

Tonsillomycoses. According to A. Castellani,[2] tonsillomycoses or affections of the tonsils due to fungi higher than bacteria (mycetes) are not very rare. The author has seen cases in tropical and sub-tropical countries and also on the continent of Europe and in England. They may be caused by a variety of fungi, mostly fungi of the genera Monilia, Oidium, Hemispora, Nocardia. They may be clinically separated into two groups: chronic tonsillomycoses, acute tonsillomycoses.

Chronic tonsillomycoses have been known and studied for many years, but the subject of acute tonsillomycoses has not so far received much attention in medical literature. The subject is, however, important from a practical point of view, as acute tonsillomycoses may at times clinically simulate diphtheria, Plaut-Vincent's angina and follicular tonsillitis.

The author discusses the history of the various forms of mycetes and presents several illustrative cases.

[Tonsillomycosis is not an uncommon condition and is usually discovered by accident since it causes no symptoms. Its only cure is removal of the tonsils and this only when it is restricted to the tonsils. As a mat-

(2) New Orleans M. & S. J., April, 1926.

ter of fact, the condition usually disappears spontaneously.—Ed.]

A Convenient Pillar Retractor. The pillar retractor in common use for tonsillectomy is unsatisfactory. Its straight handle many times brings the hand of the assistant who is wielding it directly into the line of the surgeon's vision, and, in many cases, fills valuable space over the limited field of operation.

Thus, the tonsillar fossa is not always satisfactorily exposed; bleeding points may remain undiscovered and unligated, and residual tabs of tonsillar tissue may be overlooked.

With these things in mind, C. E. Haines[3] had the handle of a Hurd retracter bent to an angle of 90 degrees. This was done in a few minutes by an electric welder. The new instrument thus formed is much more satisfactory than the straight-handled one; with it, the assistant's hand keeps well to one side, out of the surgeon's line of vision and out of the way of his hands.

The author has assisted and has been assisted with this new instrument many times; the invariably good results have demonstrated its superior convenience.

Pemphigus

Pemphigus as a Beginning Tonsillar Manifestation. H. Dintenfass and S. S. Greenbaum[4] report the case of a man, aged 55 years, who complained of difficulty in swallowing for several weeks.

In the examination of the throat there was disclosed a distinct swelling of the left tonsil and peritonsillar region not unlike quinsy, but with the mucous membrane of a fiery red color surrounding a gray area on the mesial aspect of the tonsil about the size of a dime. The uvula was also considerably swollen and of the same red character.

Thinking that this was probably one of the throat

(3) J. A. M. A., June 5, 1926.
(4) Laryngoscope, October, 1925.

infections which were prevalent in the recent grippe epidemic, hot alkalin gargles were prescribed and the patient was ordered to come back in several days. On his return and thereafter for about two weeks the condition appeared the same. At the end of this time, however, there was a decided change for the worse. There was now an involvement of the right tonsil similar to that of the left tonsil. The gums were spongy, and bled quite freely. The tongue was coated but its edges and tip were quite red. (Pl. XXXI). There was no glandular swelling under either angle of the jaw. The Wassermann test was taken but proved negative for lues. Smears from the mouth and throat showed no evidence of Vincent's angina.

Five weeks after the first observation no diagnosis had been made. At this time, however, a large blister appeared on the chest which was definitely diagnosed pemphigus vulgaris at the skin clinic. This immediately was the solution of the difficult question of the pharyngeal and oral condition.

Acute Pemphigus of the Throat, With Positive Vincent's Angina. This case, reported by H. A. MacGruer and A. H. Rubenstein[5] was that of a man, aged 54, who complained of a sore throat, which caused a tightness and a difficulty in swallowing; the duration of these complaints dated back but three days, prior to the time of his first visit. The patient had a wisdom tooth extracted one week before the onset of the throat trouble. He developed a slight hoarseness on the second day of his illness. The past history was unimportant other than revealing a slight attack of the grip ten years prior to examination. The present history was likewise unimportant, other than to show that he was apparently in an excellent state of health previous to this complaint.

The examination of the mouth and pharynx revealed diffusely distributed, macerated, irregularly shaped

(5) Arch. Otolaryng., March, 1926.

ulcerations of the mucous membrane of the hard palate, and on the sides of the left and right cheeks in the region of the posterior molars. This denuded mucosa was irregular in outline, very superficial in depth, and had what appeared to be a pseudomembrane over it, which on removal left a bleeding surface; it had a slightly indurated and reddened margin.

The diagnosis made at the time was Vincent's angina, which diagnosis was strengthened by the report from the laboratory that the smear showed an abundance of spirochetes and fusiform shaped bacilli, with the report of positive Vincent's angina.

At the end of ten days the patient complained of increasing hoarseness, and reexamination of the larynx showed marked congestion of the cords and the trachea, but no ulcerations were seen.

The blood Wassermann test was negative on two occasions. Vincent's angina was again positive, and, as the condition did not seem to be progressing favorably, it was determined to give the patient an intravenous injection of arsphenamin, and 0.3 gm. was given with no reaction.

Three days later, the seventeenth day of the disease, for the first time the patient developed bullae on the soles of both his feet. This was the first evidence of any skin lesion. No other skin lesions occurred for the next five days, although new lesions continued to crop up in his mouth.

On the twenty-second day of illness bullae were definitely seen in the mouth, on the buccal surfaces of his lips, for the first time. Soon, however, generally distributed typical bullae over the patient's entire body began to develop, and with his rapid decline, the diagnosis of pemphigus was made.

The patient soon became septic, and rapidly became worse, dying in five weeks from the onset of the disease.

Pemphigus of the Throat. A married woman, aged

57, came to the Wisconsin General Hospital for examination because of constant sore throat of four years' duration. Several times during a period of two years swab cultures had been made and sores in her throat had been punctured by a physician, examination of the contents revealing a diphtheroid bacillus.

General examination revealed a woman in advanced life, poorly nourished and somewhat emaciated. The Wassermann test was negative, and examination of the chest failed to show any evidence of tuberculosis. The blood count was within normal limits.

It was noticed that the eyes were causing discomfort, and examination revealed marked thickening of the lids and conjunctiva, entropion and symblepharon, and acute conjunctivitis on the right. The membrane of the nose was covered with large crusts such as are seen in ozena. The tongue was smooth. The pillars and pharyngeal mucosa were markedly scarred and showed areas of hyperplasia. A pseudo-membrane extended down to the epiglottis, but did not involve the cords. A swab culture of the throat revealed a diphtheroid bacillus which did not develop in rabbits.

Although the first examination did not reveal blebs, after observation for several days two large blebs appeared, one on the posterior pillar and one on the left lateral band. These were punctured and a straw- colored, sterile fluid was evacuated. A swab culture at this time revealed mixed infection, with no predominating organism.

Lesions similar to those observed in the throat were found in the vagina. A number of scars were noted on the skin of the forearms and hands.

R. A. Barlow[6] states that the etiology of pemphigus of the pharynx is decidely obscure. Various organisms have been found, but the findings of the various investigators lack uniformity. In the present case,

(6) Wisconsin M. J., September, 1925.

a diphtheroid organism was found in studies extending over a period of two years.

The mucous membrane of the pharynx shows marked hyperplasia with many cicatricial bands and scars, even the pillars being involved. The scarring with contraction strongly resembles that observed in an old luetic pharynx. A fibrinous membrane forms which is fugitive in character. Eventually small blebs appear at some point in the pharynx; on puncture the blebs yield a thin straw-colored fluid which is sterile culture. Careful general examination will frequently reveal similar lesions in the vaginal or rectal mucosa. The presence of blebs must be demonstrated to establish a diagnosis.

All forms of local treatment which have been tried have given little or no relief. The best results are obtained by the oral administration of some form of arsenic, such as Pearson's solution. Fowler's solution or salvarsan. Various physicians report that cacodylate of iron and coagulen, as well as Pearson's solution, give relief.

The prognosis is practically 100 per cent. fatal. In almost all cases reported up to the present time the patients have died within three years. Generalized pemphigus has usually developed before death.

The Pharynx

The Effect of Short Wave Roentgen and Gamma Rays on Naso-Pharyngeal Lymphoid Tissue. It is the belief of J. R. Ranson and S. Withers[8] that:

1. No tonsillectomy can remove all of the objectionable lymphoid tissue in the pharyngeal mucous membrane, and when the excision of large amounts is done early in life, the outlying parts of the ring appear to be stimulated to growth.

2. Regardless of its therapeutic properties, the

(8) Phys. Therap., X-ray, Rad., July, 1926.

demonstration of certain biological properties of cells by roentgen or gamma rays has been a permanent contribution to science.

3. Tonsillar tissue is probably one of the most "radiosensitive" tissues of the body.

4. It is possible to produce marked retrogression in leukocytic elements and tonsillar tissue with roentgen and gamma rays.

5. The use of roentgen and gamma rays in affecting an atrophy of lymphoid tissue is not new and its use is founded on sound biological principles.

6. Suitable means of application have been devised.

7. Radiation treatments should aim to produce 50 per cent. of the erythema dose throughout the pharynx.

8. Such treatment can be given with safety to the patient, with the absence of constitutional reaction and no mortality, even in the presence of subacute infections.

9. With the retrogression of the lymphoid elements of the pharnyx and nasopharynx, there is conclusive evidence showing that these areas cease to harbor pathogenic bacteria, especially streptococci and diphtheria bacilli.

10. Radiation therapy causing a retrogression of all lymphoid structures of the pharynx will, in general, accomplish more than the surgical excision of the faucial tonsils alone, in ridding the patient of infection in this area.

[The advantages visualized by the enthusiastic radiologist in the treatment of tonsil disease by radiation is one thing and the results obtained by unbiased observers in the application of radiation is another. Theoretically radiation should, according to the enthusiastic theorist, accomplish without surgical means, in enucleation of the tonsils, the elimination of all lymphoid hypertrophies in the pharynx and render the pharynx free from bacteria. How far short of such a result the treatment by radiation thus far has fallen is

pretty well known. That tonsils may be shrunken from the partial destruction of lymphoid tissue from the application of radiation has been amply demonstrated, but that this shrinking of the tonsils obliterates tonsil disease any more than when it is the result of chronic tonsillitis is doubtful. The clinician has learned to recognize that chronically shrunken tonsils are often the persistent carriers of chronic infection—perhaps more so, even than tonsils that represent some hypertrophy. The observations that have been made on the reduction of lymphoid tissue through radiation are of scientific interest, but the clinician is not so likely to be as hasty in reaching unwarranted conclusions regarding the therapeutic values of such reactions as is the enthusiastic radiologist.—Ed.]

Bacteremia Associated with Acute Hemolytic Streptococci Throat Infections. According to H. C. Ballenger,[5] throat infections due to the hemolytic streptococcus have assumed a rôle of vast importance in recent years, on account of the almost unlimited variety of complications that may result as secondary manifestations. Those secondary manifestations (or complications) are often difficult to follow and correlate. That a bacteremia is responsible for many, if not a majority, of these complications is becoming increasingly evident.

In winter months these epidemics of sore throat almost assume the proportions of a pandemic. The clinical picture of an acute throat (upper respiratory tract) infection is a mild coryza, with a sensation of fulness or dryness of the pharynx with slight discomfort on swallowing. Headache, frontal or occipital, may be present. Sense of malaise is rather marked and out of proportion to the appearance of the throat. Chilliness and slight fever is usually present, especially in children. The temperature in uncomplicated cases lasts from three to four days. A secondary rise is not

(5) Arch. Otolaryng., August, 1926.

uncommon. The back and legs may ache, but just as frequently the aching is absent. Occasionally, a slight nausea and vomiting are present in children. Hoarseness is uncommon, but a slight tickling cough is usually present. The face is flushed, and occasionally an erythema over the chest is found. The anterior cervical lymph glands are usually tender and slightly swollen. The posterior lymph glands are occasionally involved. A mild conjunctivitis is present in almost 100 per cent. of the cases during the acute stage.

The throat is diffusely reddened and inflamed. The uvula is edematous and hyperemic. The tongue is coated and the breath fetid. All the lymphatic structures of the mouth and pharynx are red and swollen. The tonsils may be spotted, but more frequently are only inflamed, similar to the pharynx.

A moderate leukocytosis of 15,000 to 18,000 is usual, persisting from four to eight days after the temperature has become normal. The red cells are not affected in uncomplicated cases. In those cases of acute otitis media or acute throat infection in which a bacteremia is suspected, the patient is usually bright eyed and alert (mental stimulation). There is no clouding of the intellect, even with a high temperature. Delirium is usually absent. The appetite is good, with a desire for much water. The temperature usually has a fall and rise during the twenty-four hours. The patient feels fairly comfortable. If it is an otitis case and an operation is performed, there is usually a drop in the temperature but a subsequent rise. The abscesses of a "septicemia" are comparatively rare in this type of a bacteremia.

There are four main channels by which the infection may be transmitted to other portions of the body:

1. Spread by continuity, as evidenced by a peritonsillar abscess, infection traveling through the tissues of the neck and even invading the mediastinum, otitis

media, mastoiditis, later sinus thrombosis, brain abscess, and so forth.

2. Entrance into the alimentary canal via the stomach. Davis has shown experimentally the fate of the hemolytic streptococcus when injected into the stomach of rabbits even in large numbers. They are all killed in from two to five minutes. Apparently the streptococci do not pass the barrier of the gastric juices in any appreciable number.

3. Extension by way of the lymphatics. This is demonstrated in many cases by a cervical adenitis, retropharyngeal abscess, and the like.

4. Direct infection of the blood stream. With the hemolytic streptococcus, it is highly probable that this is the most important route by which the bacteria are conveyed from the primary focus, whether of the acute or chronic type. A chronic bacteremia can most plausibly explain the term "subinfection," as used by Adami.

The author reports five illustrative cases and concludes the following:

1. A bacteremia secondary to an acute hemolytic streptococcic throat infection is probably of common occurrence, and possibly is the usual accompaniment of this type of infection.

2. This bacteremia, if present, is of a transient or evanescent character in the vast majority of cases, and is not accompanied by the usual signs of a "septicemia" other than an elevation of temperature.

3. In a small percentage of instances, the hemolytic streptococcus lodges and multiplies in some distal portion of the body, and gives rise to the secondary manifestations characteristic of this type of throat infection.

4. With an acute otitis media or an acute mastoiditis present, a positive culture of the hemolytic streptococcus from the blood stream is not of as great diagnostic import, so far as a thrombosis of the lateral

sinus is concerned, as are the other pus producing organisms.

Hematologic Investigations on Some Infections in the Throat and in Children With Adenoid Growths. In this extensive piece of work V. Schmidt[6] finds the following:

1. The gradual decrease of lymphocytes throughout childhood reported by previous authors has been substantiated. However, very great variations in the lymphocyte count in different children within the same ages seem to occur. By taking the average values in groups covering a period of three years, the individual variations seem to be eliminated, and a decrease, which has its maximum at the age of eight, is found.

2. A corresponding increase in the leukocyte count is seen. This increase is also on its maximum about the eighth year.

3. The eosinophile cells diminish in number throughout childhood. By taking periods of three years, a rather even decrease is found until the age of ten.

4. The figures for the monocytes are rather constant throughout the years from three to fourteen.

5. In children with adenoid growths the proportion of lymphocytes in the blood is, on an average, lower than in normal children; particularly after the seventh year, by taking the average periods covering three years, the lymphocyte count of adenoid children is so considerably lower than that of normal children that, evidently, this cannot be due to casualties.

6. As a higher total count (8,435 on an average, as against 7,674 in normals) and a higher proportion of polynuclear neutrophiles are found in adenoid children, these factors have been taken to indicate an infectious state in such children.

7. In children with adenoid growths an increase in the proportion of eosinophile cells in certain age

(6) Ann. Otol. Rhinol. & Laryng., June, 1926.

groups about the seventh year was demonstrated. This factor could not be referred to dermal affections in the children examined, nor, as far as could be ascertained, to helminthiasis.

There is a marked difference between the blood picture of the scarlatinous angina and that of the ordinary angina tonsillaris as regards leukocytosis and the number of eosinophile cells. Scarlatina has a permanent leukocytosis, which persists after the cessation of the febrile stage, often for several weeks into the convalescence. The number of leukocytes range between 8,000 and 26,000 in the first sixteen days of disease. Leukocytosis was not quite regular; although on the whole, it was the rule that the number of leukocytes decreased from the highest during the first days to lower later on.

In contradistinction to these findings those found in ordinary angina showed a quite regular decline from the highest on the first and second day of disease to normal as early as on the third, fourth, fifth or sixth day.

The investigations of leukocytosis in patients with peritonsillar abscess and peritonsillar phlegmon revealed that:

1. Patients with peritonsillar phlegmon and abscess have leukocytosis; in a single case of those examined the leukocytes reached nearly 30,000, while in the remaining cases counts between 15,000 and 23,000 were found.

2. Incision brings about a rapid and great fall in the number of leukocytes when pus is evacuated (abscess), while no fall is seen by incision in the case of phlegmon.

3. Tonsillar abscess frequently gives rise to a leukocytosis of from 13,00 to 20,000 (often without any increase of the temperature). The existence of this leukocytosis in connection with the subjective complaints afford a more reliable indication of the infec-

tious state of the patient than the relations of the temperature and the pulse.

4. In patients with chronic tonsillitis pus is often found in the tonsils—apart from the acute exacerbation—without any increase in the number of leukocytes, while leukocytosis is present in the acute stage, even without increase of the temperature.

5. Patients with simple tonsillar hyperplasia and chronic pharyngitis have no leukocytosis.

Pathology of Keratosis Pharyngis. It is the belief of Anthon[7] that this condition is essentially a cornification of the epithelium, not only of the crypts of the tonsils, but of those of the entire Waldeyer's ring. The leptothrix is recognized as a constant accompaniment of this condition, but not in a causal relation, but rather as a secondary inhabitant. Therefore the names "myeosis tonsillaris" and "tonsillitis leptothrixia" are misnomers.

A careful histologic and bacteriologic examination has been made, and the author believes he has shown that an encapsulated diplobacillus of the Friedlander type is a constant accompaniment. While the Koch cycle has not been completed, the author suspects a causal relationship, if not with the cornification at least he feels sure that the loss of luster of the pharyngeal mucosa in keratosis is due to the well known mucus producing effect of this diplobacillus.

Aberrant Pulsating Vessels in the Pharyngeal Walls. A girl, aged 18 years, complained of dysphagia. Examination by H. Dupuy[8] revealed a marked left retropharyngeal infiltration, not apparently pulsating. A few seconds after incision of the mass, mouthsful of blood gushed out in quick succession. The author quickly applied pressure and placed the patient prone on the floor. The House Surgeon who came at the call for help ligated the external carotid on the spot.

(7) Ztschr. f Hals-, Nasen- u. Ohrenh., 12:298, 1925.
(8) Laryngoscope, April, 1926.

No bleeding followed this on removal of the pressure, and the patient recuperated quickly. The author concludes that:

1. Pharyngeal vascular anomalies are not generally known and appreciated by those doing surgery in that region. One cannot overstress the clinical importance of this knowledge.

2. There is need for further anatomical studies relating to these vascular variations in the pharyngeal wall. Is the aberrant vessel the internal carotid, or is it a branch of the external carotid? A life problem will, sometimes, depend on the acuracy of this knowledge, and on its application.

3. The author's personal experience rather favors the viewpoint of regarding these arterial anomalies in the external carotid artery. Therefore its ligation will usually control fulminating hemorrhage in surgery of the pharynx.

4. All who operate in the faucial and pharyngeal field should, in routine throat examinations, be on the lookout for these dangerously situated vessels. It would serve the purpose of safeguarding our patient, and by increasing the number of observed pharyngeal arterial variations, will lead to a better study and appreciation of these conditions.

5. Operators in this domain of surgery should master the technic of ligating the external carotid in the superior carotid triangle.

The Surgery of Malignant Disease of the Pharynx. Malignant disease of the laryngo-pharynx is not at all rare, according to W. Trotter[9]. This author divides these cases into two groups, the epilaryngeal, and the hypopharyngeal.

In the first group the growths occur on and immediately around the upper opening of the larynx. (Fig. 28). The great majority of them ocur in the male sex, and of cases of malignant disease of the laryngo-pharynx

(9) Brit. M. J.. Feb. 13, 1926.

in that sex the great majority are of this type. They occur in men who have reached or passed middle age. Four common starting points can be made out by the study of early cases: these are: (1) the epiglottis; (2) the aryepiglottic fold, especially toward its arytenoid extremity; (3) the lateral pharyngeal wall outside and away from the arytenoid; and (4) the pyriform sinus. When these starting-points are known a little experience will enable one from the laryngoscopic examination to estimate with some precision with which type one has to deal in a given case. The decision is important and worth an effort to attain, as it has a direct bearing on treatment and prognosis.

It may be stated that growths starting at any of the three points first mentioned (the epiglottis, the fold, the lateral wall) lend themselves to satisfactory operative treatment. At early and even moderately advanced stages a cure or freedom from the disease for many years can be looked for with reasonable confidence, without great operative dangers, and with no permanent multilation or disability. The case is different with growths that start in the pyriform sinus. In this case the situation of the growth makes it symptomless in the early stages, and also leads to early involvement of the lateral wall of the larynx on the one hand, and of the thyroid cartilage on the other. It often happens, therefore, that by the time diagnosis is possible even an extensive and multilating operation is of little use.

There are three appearances to be on the look-out for when a growth of the epilaryngeal region is suspected: (1) an ulcer with a raised edge, which may, of course, be seen only in part, but of which the merest glimpse definitely caught is diagnostic; (2) a collection of muco-pus which the patient cannot get rid of by swallowing; (3) a fixed arytenoid. A fixed arytenoid, if much ulcerating growth can be seen, generally indicates a late stage of disease; if little ulcer-

ation can be seen it points to the dreaded pyriform sinus type. A freely movable arytenoid, even when the growth seems of formidable size, is always a favorable sign. The amount of fungation of a growth is not necessarily a measure of its gravity; sometimes the pharynx seems filled by an ugly sloughy mass which at operation proves to be semi-pedunculated and arising from a relatively localized epithelioma.

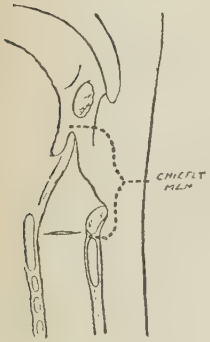


Fig. 28.

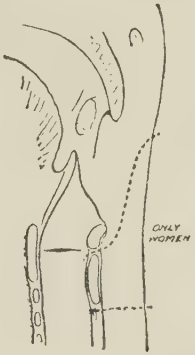


Fig. 29.

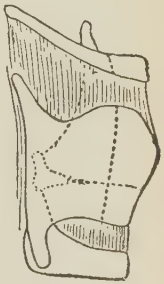


Fig. 30.

Fig. 28.—Distribution and sex incidence of epithelioma of laryngo-pharynx. The epilaryngeal group, the ordinary type occurring in men.

Fig. 29.—Distribution and sex incidence of epithelioma of laryngo-pharynx. The hypopharyngeal group, practically limited to women.

Fig. 30.—To illustrate the principle of the operation of lateral trans-thyroid pharyngotomy. The outline of the laryngeal skeleton is shown. The finely dotted lines indicate the relative positions of the aryepiglottic fold, the arytenoid cartilage, and the vocal cord. The thickly dotted lines show where the great cornu and the thyroid ala are divided in the operation. When these parts have been removed the laryngo-pharynx is accessible.

The growths of the hypopharyngeal type occur in the narrow tubular part of the pharynx behind the cricoid cartilage. They are practically limited to women, and include the great majority of epitheliomata of the pharynx in that sex. (Fig. 29). They appear in adult and middle-aged, and are not uncommon in the fourth decade. A remarkable feature of these cases is that the history given by the patient often shows that

there has been some difficulty in swallowing for many years, and that on this slight disability the serious dysphagia has gradually supervened.

In the presence of strong reason to suspect post-cricoid carcinoma a characteristic laryngoscopic picture should not be waited for, but a direct examination should be made with the bronchoscope under an anesthetic.

In regard to treatment of these growths there is one method of general utility in the operative treatment. This is the operation of lateral (trans-thyroid) pharyngotomy, which is the foundation on which all the different procedures, from the simplest to the most elaborate, must be built up. It is primarily a method of access, and depends on the anatomical fact that the laryngo-pharynx lies within the laryngeal skeleton. If the great cornu of the hyoid bone and ala of the thyroid cartilage are removed, the wall of this part of the pharynx is disclosed unopened, and through it the situation and extent of a growth can be determined by palpation with some precision. It can now be decided if a radical procedure is possible, and what it should be.

The author has found three groups of cases: (1) inoperable; (2) operable cases of the more serious type; and (3) operable cases of the more favorable type. He describes his technic in detail for lateral pharyngotomy (Fig. 30).

Lipoma of the Pharynx. F. R. Herriman[1] presents a series of 25 cases of pharyngeal lipoma. Males and females are about equally divided, and the ages vary from 4 to 92 years. The point of implantation include various locations in the pharyngeal walls, as well as the soft palate, tonsil, and supratonsillar fossa.

As regards *cellular pathology*, pharyngeal lipomata show the characteristics of lipomata elsewhere in the body. In this series of 25 cases, there were nine in

(1) Laryngoscope, May, 1926.

which the microscopic examination showed pure lipoma in all specimens examined; others were noted as pure lipoma in certain portions of the growth and fibroma in other portions; still other tumors were reported as lipomyxofibroma.

Prognosis in pharyngeal non-malignant tumors is generally good, although intervention is sometimes laborious and subject to surprises. Treatment is surgical. Pediculated tumors are removed by cold snare or galvanic loop; sessile tumors are removed by dissection. Pharyngotomy is reserved for very rare cases which are inoperable by the buccal route. Without operation, the patient is in danger of death from strangulation.

Agranulocytic Angina: Report of a Case with Fracture of the Tibia. In the last three years, twenty cases of agranulocytosis have been reported. Although this condition has been given various names, such as agranulocytic angina, malignant leukopenia with low neutrophil count, and so forth, all have the same peculiar blood picture combined with lesions of the throat. The erythrocytes, hemoglobin, and platelets are normal or slightly lowered. The leukocytes are greatly reduced, sometimes being as low as 600 cells per cubic millimeter. This reduction occurs almost entirely in the granular leukocytic series.

The onset is similar to any severe acute infection. Only women between the ages of 22 and 65 have been observed with this condition. Inflammation and ulceration of the throat, tonsils, tongue and larynx is fairly constant. Similar inflammatory reactions have been noted in other parts of the body.

The case reported by R. J. Hunter[2] is that of a woman, aged 45, who had been admitted to the hospital on account of fracture of the left tibia. On admission, the blood picture was approximately normal. For two weeks she followed the course of the usual fracture

(2) Laryngoscope, May, 1926.

case. At this point she developed fever and body pains. The temperature was 102 F., and a typical erythema multiforme developed. A few days later sore throat was complained of; inflammation and erosion of the soft palate, uvula and anterior faucial pillars were noted. A blood count at this time showed a marked leukopenia with total absence of polymorphonuclear leukocytes. A pulmonary condition resembling bronchopneumonia developed. Death occured in about ten days. Permission for necropsy was refused.

The author suggests that in all cases of obscure throat ulceration complete blood studies should be carried out.

Diseases of the Larynx and Trachea

Laryngeal Tuberculosis. Laryngeal tuberculosis is always secondary to pulmonary tuberculosis, whether or not the primary lesion in the lungs is clinically demonstrable. According to C. C. Jones[3] the symptoms of tuberculous laryngitis are not pathognomonic. They vary to some extent according to the degree of local involvement. The majority of tuberculous lesions are low grade and chronic in type, therefore have a slow insidious onset. The two most common symptoms suggestive of laryngeal involvement are huskiness of the voice, and a sense of discomfort referred to the hypopharynx. The huskiness of the voice is slight but persistently recurs, usually becoming manifest in the afternoon, being induced by vocal or general fatigue. The paresthesia complained of may consist of a dryness, a tickling, or a burning sensation in the lower part of the throat. It may simulate a mild attack of globus hystericus. Actual pain and dysphagia are late complaints resulting from ulceration of perichondritis. The laryngeal condition may be a prominent factor in the production of cough. It must be remembered

(3) J. Iowa M. Soc., Oct. 10, 1925.

that tuberculous laryngitis exists without causing any alteration in voice or localizing symptoms.

In the larynx, the favorite site for early tuberculous lesions is in the posterior commissure which is in contrast to syphilitic lesions which are prone to attack the anterior commissure. There are three clinical types of lesions, the acute, subacute, and chronic. The line of demarcation between these stages is often indefinite. If the onset is acute, which is the exception, the clinical picture is one of a diffuse hyperemia, like that of laryngitis simplex from which it cannot be differentiated by the appearance of the local lesion.

The greatest difficulty is encountered in differentiating subacute tuberculous laryngitis and tertiary lesions, both being characterized by granulomata and ulceration. First the voice of the tuberculous is usually weak and husky, and more so in the afternoon, while that of the syphilitic is characteristically raucous and present throughout the day. Syphilis is prone to attack the anterior commissure, while tuberculosis favors the posterior commissure. The color of a syphilitic lesion is maroon, while that of a tuberculous lesion is a paler shade of red. The syphilitic ulcer is punched out, has regular edges, a dirty gray base, is deep, tends to extend in depth rather than in surface area, and is surrounded by a ring of maroon-colored induration. On the contrary tuberculous ulcers are paler and sluggish looking, with irregular edges, a yellowish base, are shallow, and tend to extend in surface area rather than in depth. Perichondritis occurs much earlier and more frequently in syphilitic lesions than in tuberculous, due to the mode of extension of the ulcers. Cervical glandular involvement is more frequent in syphilis than in tuberculosis. In an individual with syphilitic laryngitis the laryngeal symptoms will predominate, but with the same degree of tuberculous involvement the systemic and pulmonary symptoms usually predominate. A syphilitic larynx will respond favorably to the

administration of potassium iodide internally, but a tuberculous lesion is often aggravated by its administration. The Wassermann reaction should be determined in all laryngeal cases, but it must be remembered that a negative report does not necessarily exclude syphilis, and that tuberculous and syphilitic lesions may coexist in the larynx.

Chronic laryngeal phthisis and chronic laryngitis simplex may easily be confused inasmuch as both often present an area of interarytenoid infiltration, and color changes are always relative and only suggestive. In this type, as in the acute, the differentiation depends upon the exclusion of causes in the upper respiratory tract, the pulmonary findings, and the subsequent course of the lesion.

In differentiation from early intrinsic carcinoma of the larynx in persons beyond the age of forty requires a biopsy. In such lesions it is not advisable to procrastinate, permitting the lesion to become extrinsic should it be carcinomatous. The usual site of carcinoma of the larynx is in the posterior third with a predisposition for the cords, resulting in an early fixation or limitation of the cord involved.

In the treatment the author advises absolute and total silence. He believes that in most instances this regime can best be carried out in the sanatorium. Local treatment of the larynx with various astringents is harmful in that coughing and gagging are induced, which are fatiguing to the patient and contrary to the rest regime.

There are two groups of cases which will not respond to conservative treatment. One group includes certain cases presenting a sluggish low-grade interarytenoid infiltration, ulceration, or tuberculoma with a stationary pulmonary condition. These lesions respond remarkably well to electric cauterization under local anesthesia by the direct method of laryngoscopy. Improvement in the laryngeal, pulmonary, and general

conditions usually follow this procedure. The second group comprises those cases showing a progressive increase in their pulmonary and laryngeal involvement and activity. All that can be done for them is to furnish them some relief. Here again, painting and swabbing are contraindicated. Steam inhalations may afford some relief. If a painful dysphagia develops, the aspiration of orthoform, paresthesin or anesthesin powder prior to swallowing will often alleviate the discomfort of eating. If this fails an alcoholic injection into the neighborhood of the superior laryngeal nerves will furnish relief.

The prognosis as to the laryngeal lesion cannot be predetermined, due to the dependence of the course of the laryngeal lesion upon the course of the pulmonary lesion.

The Treatment of Laryngeal Tuberculosis with the Goerz-Wessely Lamp. The Wessely lamp is an arc light which burns with specially constructed and impregnated carbon bars according to the Goerz system, by which the greatest concentration of rays is thrown to one side and made to converge into a cone through the medium of a quartz optic. The heat rays are absorbed by a water jacket connected with the quartz optic. In other words, this machine is a carbon arc light, watercooled, quartz lamp.

With this lamp only one patient at a time can be treated. The average time of exposure is eight minutes, given at first every other day and later at longer intervals. According to J. C. Miller,[4] about twenty patients can be treated during a forenoon. Those in good general condition, or are otherwise favorable subjects, are irradiated directly by means of the Seiffert universal direct laryngoscope with chest support. (Fig. 31). Patients so treated have the benefit of the ultraviolet rays striking the lesion directly, shortening the period of treatment considerably. Frail individuals

(4) M. J. & Record, Feb. 3, 1926.

or those with advanced pulmonary lesions or those intolerant and too sensitive for the direct method, are

Fig. 31.—Direct method of irradiation. Patient suspended by means of the Seiffert direct universal laryngoscope, rays striking the lesion directly.

treated indirectly in the sitting posture by means of an all metal laryngeal mirror which is held suspended by

Fig. 32.—Patient looking at his own larynx. Indirect method of irradiation. Patient sits in front of a perforated magnifying mirror and with the laryngeal mirror suspended he can regulate the ray of light directly upon a given lesion.

a special contrivance attached to the teeth. (Fig. 32).

These steel mirrors are utilized because they reflect at least 42 per cent. of the valuable therapeutic rays into the larynx; while the ordinary glass mirrors absorb these rays, reflecting only about 9 per cent. It goes without saying that this method is not as good as the direct method, although more comfortable. The patient sits in front of a large mirror which is centrally perforated like a head mirror and can see his own larynx. In this manner he is able to regulate the laryngeal mirror himself whenever the rays do not strike a desired area. Cocain hydrochlorid 10 per cent. to which a few drops of adrenalin chlorid are added is used to swab once or twice the soft palate, root of tongue, posterior pharynx wall and the interior of the larynx whether the direct or indirect methods are used.

The period of treatment varies from a few weeks to one and one half years. At the end of treatment, the patients are advised to call once a month for observation.

Superficial tuberculous ulcers heal under this form of treatment rapidly, leaving at first a small depression which soon fills out to an even surface. Granulations become smaller and shallower and one can distinctly differentiate the irradiated area from the nonirradiated one. Only the irradiated ulcer heals. Those neighboring in juxtaposition and not exposed to the rays are not so influenced. Massive infiltrations of the posterior larynx wall under the influence of the rays change their shape and become smaller. Finally, there remains a pale transverse elevation which on phonation is thrown into several folds. Dysphagia, when due to superficial ulcerations disappears in many cases following only two or three exposures; when no change even in the appearance of the lesion is yet noticeable.

The Treatment of Laryngeal Tuberculosis. The following observations were made on 49 cases which were treated by R. S. Moore[5]. First, the healthy mucous

(5) New York State J. M., Mar. 15, 1926.

membranes stand the sun in larger doses than the skin accepts. After excessive radiation, there follows a latent stage of a few hours when a light gray discoloration of the epithelial membranes occur. Blisters, ulcers and edemas are never produced when the work is done carefully. Edemas as part of the pathology are never influenced by ordinary doses. Flat ulcerations heal to an invisible little elevation which persists a long time, and which later on completely flattens out. Granulations become smaller and flatter, but one can always distinguish the place where the light acts from the place where it does not act. They become more and more epithelialized and after months can be noticed by the uneven surface. Infiltrations gradually become smaller until a pale green swelling remains which shrinks up to several wrinkles. Dysphasia usually subsides with the disappearce of the superficial sore. Sometimes a large tubercular lesion is cured in a few weeks, while a small one will heal only after months, which can be explained only by the general condition of the patient, the extent of the lung lesions and the different degrees of regenerative power. Ulcerations of the mouth, tongue and pharynx heal much faster than those of the larynx. The cure takes longer the deeper the ulcers lie.

In the author's series of cases, 33 per cent. were cured, 35 per cent. improved, 13 per cent. improved temporarily, 8 per cent. made a change for the worse, and treatment was interrupted, and 12 per cent. discontinued treatment because of dissatisfaction.

The author's plea is for a more systematic study of the larynx in all cases of tuberculosis followed by an examination at least once each month. Rest is the first essential. Light therapy should be used in any case which is afebrile, those patients who are in fairly good condition being subjected to the direct application of the ray while their less fortunate brothers may be given the easier form of treatment, namely, the indirect ray.

If the light does not yield satisfactory results the actual cautery must be employed, scarring over the superficial ulcerated areas which are not on the chords, and which do not involve too much surface. With the cautery, the infiltrations can be punctered when this seems advisable. If the epiglottis is badly involved associated with dysphagia it should be amputated; if there are pedunculated masses posteriorly they can be bitten off and the bases cauterized.

Galvanocautery in Treatment of Laryngeal Tuberculosis. L. De Reynier[7] reports, among others, three cases in which galvanocauterization was followed by excellent local results. Pronounced infiltration of the arytenoids and epiglottis, as well as extensive ulcerations of the false cords and epiglottis disappeared in two or three months, after having persisted for months and years. In a case of tuberculosis of the tongue of over four years' standing the lesions disappeared within two months. In another, ulceration of the lip healed in two months after two applications. Cicatrization of the tuberculous lesions of the larynx and elbow was manifest in the third case. The author asserts that similar results were obtained in hundreds of cases during the last twenty years.

The influence of the galvanocautery may be due partially to afflux of leukocytes and subsequent phagocytosis. Under the action of heat, the adjacent healthy cells may produce antitoxins or retain those of the blood, thus acting on the tuberculous tissues. The galvanocautery was beneficial likewise in treatment of syphilitic gumma of the larynx. A syphilitic infiltration of the arytenoids subsided almost entirely at one sitting of galvanocauterization. The healing of the larynx did not influence in any way the tuberculous process in the lungs.

Cancer of the Larynx . According to J. E. MacKenty,[8] the results achieved in the arrest of cancer by sur-

(7) Presse med., Mar. 10, 1926.
(8) Arch. Otolaryng., April, 1926.

ery in this field far excel those obtained in any other part of the body. In intrinsic cancer, lymphatic extension is delayed for a varying period depending on the virulence and location of the disease.

The author performed a total laryngectomy on three patients with incipient cancer, and had the larynges carefully sectioned and examined. The results showed that in two of the cases there was subsurface extension up to and into the angle of the anterior commissure. In the third case, the subsurface lines went forward and backward, undermining the entire extent of the cord. Thus the question is answered as to why some patients apparently with an incipient condition die of recurrence even after total laryngectomy. It is still a mystery why some patients with an advanced condition recover. Perhaps here a strong somatic resistance to the disease exists.

The author has made it a rule in these cases to add two-thirds to the visible manifestation of the disease in estimating its true extent, and on the judgment thus formed, to select the type of operation thus indicated. Laryngectomy assuredly offers greater security than thyrotomy though much greater disability. Secondary operations have been futile. As in other surgical fields, one chance only is given to cure cancer. If our leaning is too much in the direction of conservatism, the patient must often pay with his life. An early recognition of intrinsic cancer is a crying need, and would, with the patient's consent to operation and the elimination of the lure of radium, bring about a high percentage of cures.

Starting with the one-stage operation eighteen years ago the author steadfastly adhered to it and has brought it out of its difficulties to a point at which it may be favorably compared with its rivals. The multiple stage operation, so far as the author has observed, has shown an indifferent cosmetic result at the trachea

skin junction. Contraction of this opening necessitates the use of a permanent cannula. Over 80 per cent. of the one-stage operations in his hands have given a non-contracting, open trachea which obviates the necessity of wearing a tracheal cannula, a result both gratifying and essential to the patient for the rest of his life.

When laryngeal obstruction is present, a two-stage operation is inevitable, since a preliminary tracheotomy must be performed to restore the equilibruim in the pulmonary circulation and to allay the concomitant bronchial congestion. Embarrassed respiration contraindicates an immediate laryngectomy. This preliminary tracheotomy is not, however, technically the two-stage operation set forth by those advocating it. In the author's own obstructed cases, a medium or high tracheotomy is performed with the object of excising later, with the larynx, the tracheal area through which the cannula passes, thus returning to the one-stage operation in all its essential details. The aim is to secure a fresh healthy tracheal stump for union with the skin.

The author discusses the technic of his one-stage operation in detail, and presents numerous clear cut drawings illustrating the various steps in the procedure. Local anesthesia is preferred to rectal or prolonged general anesthesia. The writer believes his success in this operation is due to the observance of the following principles:

1. A careful study of the patient's general condition and of the metabolism, especially as shown in the blood chemistry. Patients with pronounced and irremediable metabolic imbalance are rejected.

2. Digitalization just prior to the operation in all patients in whom cardiovascular degeneration is suspected.

3. Careful dieting and colonic lavage for at least one week preceding the operation.

4. Mouth hygiene. The extraction of all diseased teeth and the treatment of diseased gums. Practically all mouths are unclean at the age at which cancer occurs. The entire absence of teeth is a distinct advantage.

5. The combination of local and general anesthesia, the latter not to exceed one-half hour in time.

Fig. 33.—Artificial larynx in use.

6. The absolute exclusion of blood from the trachea during operation, and of wound drainage after operation.

7. The placement of wound drainage so as to block off extension of the infection into the planes of the neck and the special management of this drainage during the convalescent period.

8. The anchoring of the trachea in the lower angle of the wound, and the corking of the trachea to exclude wound drainage during the entire convalescent period.

9. The use of suction for wound cleansing and for clearing the trachea of secretion. Inspissated secretions sometimes lodge at the tracheal bifurcation causing serious embarrassment to respiration. These should be removed with the bronchoscope.

10. The use of the naso-esophageal feeding tube extending only half way down the esophagus. This secures a liberal diet from the start.

11. The dressing and care of the wound should be done by the surgeon himself and not by an assistant or staff physician, probably untrained in this work. All one's experience in the handling of infected wounds is required in forestalling a serious septic invasion.

In conclusion, the author describes the artificial larynx (Fig. 33) which has been developed under his direction. With this instrument the laryngectomized patient may learn almost perfect articulation.

Cancer of the Larynx. St. Clair Thomson[9] concludes that the removal of cancerous tissue should be planned in regard to the location of the disease and not in reference to the removal of an organ.

When the disease is intrinsic (that is, in a vocal cord), the unfailing symptom of persistent hoarseness should bring the patient to a laryngologist while it is limited in extent. Early diagnosis should lead to laryngofissure, an operation which should be free from danger to life and should be followed by an adequate voice and lasting cure. If patients come late, if diagnosis is delayed, or if local recurrence takes place, success may still be secured by a partial laryngectomy.

(9) Arch. Otolaryng., January, 1926.

Extrinsic cancer is seldom operable. When it is, the cancer can be removed through a lateral pharyngotomy. A complete laryngectomy is rarely helpful in extrinsic disease. It is an operation occasionally indicated for neglected and extensive intrinsic cancer. As such cases will become rarer with progress in the education of the public and the training of the laryngologist, so will laryngectomy become a less frequent operation while laryngofissure will be more frequently and successfully performed.

Laryngofissure for Cancer of the Larynx. Fifteen cases are reported by G. Tucker[1]. Of this number, one is alive and well after three years, three are well after two years and five are well after one year. Three patients are in good health less than one year after operation. One patient after one year has had recurrence, metastasis and laryngectomy and is now well. Two deaths occured, one from late metastasis (no recurrence), the other from diabetes and bronchopneumonia.

The author's conclusions, based upon his experience with these cases, are as follows:

1. Early diagnosis is essential for cure in cancer of the larynx. In any case of hoarseness, a decision as to malignancy should be reached within two or three weeks. If the condition is operable, operation should follow immediately.

2. Laryngofissure for cancer of the larynx in early, anterior, intrinsic growths in which there are no metastases or arytenoid fixation, shows relative cures in about 85 per cent. of the cases in the statistics of Sir St. Clair Thomson, and 79 per cent. in those of Chevalier Jackson.

3. Instead of laryngectomy, the less mutilating operation of laryngofissure should always be performed in the class of cases just mentioned.

4. The patient should be observed at monthly inter-

(1) Arch. Otolaryng., January, 1926.

vals after laryngofissure, and, if there is a suspicion of recurrence, a specimen of tissue should be removed by means of the direct laryngoscope and submitted for biopsy. If malignancy is found, laryngectomy can then be done and the patient will have lost nothing by the laryngofissure.

5. If the patients are properly selected, at least 80 per cent. will not require laryngectomy after laryngofissure.

6. Postoperative prophylactic irradiation by the external application of the roentgen ray and radium is useful; but should be used with great caution as to dosage because of the danger of causing perichondritis. In Case 9 of the series, the patient died of inoperable metastasis high in the neck that became evident one year after laryngofissure. That the metastasis occured prior to laryngofissure was shown by the larynx being free of recurrence at the time of the death of the patient. It is reasonable to conclude that the postoperative radiation delayed the growth of the metastatic focus for one year.

7. The determination of the precancerous state microscopically by the pathologist, and the repeated taking of specimens of the suspicious tissue when the previous specimen is inconclusive, should give the operation of laryngofissure a higher percentage of cures in positive cases that are properly selected than in cases in which operation is done only after malignant characteristics are well advanced.

Carcinoma of the Larynx and Laryngopharynx, Treated with Radium. During the last three years, 53 patients with carcinoma of the larynx and laryngopharynx have been diagnosed and treated at the bronchoscopic clinic of the Manhattan Eye, Ear and Throat Hospital. Of these patients 30 have been under continuous observation. The remaining 23, after having been diagnosed as patients with carcinoma of the larynx and laryngopharynx, received from one to two

treatments with radium but were then completely lost trace of, so that this report deals with but 30 case reports.

In all the patients treated, when the radium was applied internally it was done by using the element in 5 to 10 mg. platinum needles. When the radium was applied externally, it was done by the block method.

Most of the patients were far advanced in the disease when first seen. Some had refused operation at the hands of the men in the nose and throat clinics and others were so far advanced that operative measures would have been futile. With but few exceptions, the type of growth was extrinsic, and if operative methods had been practiced a laryngectomy plus type of operation would have been necessary.

In the 30 cases studied C. J. Imperatori[9] found 28 males and 2 females. The ages ranged from 35 to 74 years. As to occupation, sufficient data could not be obtained to be of any value in this report. The data as to family history were not sufficient to be conclusive. There was one patient who recalled that his father died of cancer of the throat. The past history was of negative importance as regards symptoms referable to the larynx. There was one patient who had a cyst of the epiglottis removed six months previously.

The first symptoms noted by the patients were hoarseness in 18; dysphagia in 18; pain in 8, and dyspnea in 3. There was positive evidence of enlargement of the glands in 23 patients; they were not palpable in 7 patients.

The teeth were good in one patient; artificial in 9; bad in 18 and not noted in 2.

The pharynx was normal in 4 patients, and 26 had chronic pharyngitis.

There were 30 biopsy reports, and of these 29 were

(9) Arch. Otolaryng., August, 1926.

squamous cell epithelioma and one basal cell epithelioma.

The number of applications of radium in each case ranged from one to nine, the average being between two and three. There were 49 block and 31 needling applications given. The usual happening following the use of radium was that more or less of an edema of the whole growth occurred. This usually subsided within a week or so. This was particularly noted when needles were used. The wound of entrance of the needle occasionally showed as an edematous spot. One patient developed an acute toxemia following the application of the radium and died within four days. Another developed a milder degree of toxemia, on whom a laryngectomy was done. This patient is still alive. The longest period of observation was three years.

A summary of the present status of the cases is as follows:

1. Cured, one. This was a basal cell epithelioma.
2. Alive, nine. These patients are alive but very weak, and enduring all the tortures and sufferings that only a patient with cancer of the throat has during the last few months of life.
3. Alive and apparently improving, one.
4. Alive after trachetomy, one.
5. Alive after thyrotomy, one.
6. Alive after laryngectomy, one.
7. Dead, sixteen.

The author concludes that the cure of cancer of the throat, in all but exceptional cases would not seem to be obtained through the use of radium.

Blastomycosis of Larynx. While this condition is quite rare, nevertheless C. Jackson[2] believes that it is not quite so rare as the paucity of case reports and the absence of mention in the laryngologic textbooks would seem to indicate.

The author reports a case of laryngeal blastomycosis

(2) Arch. Otolaryng., February, 1926.

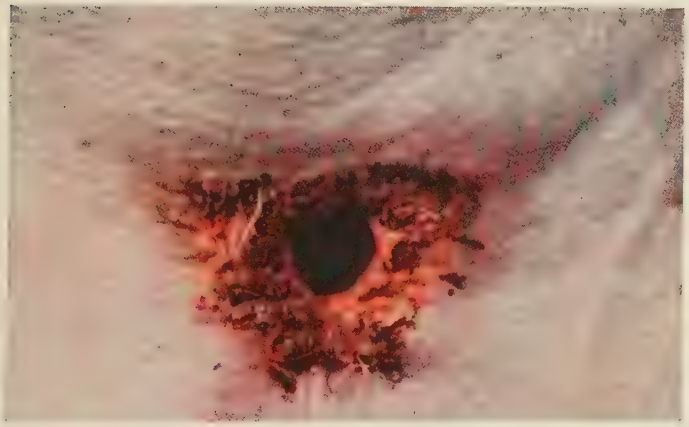
(Plate XXXII) and discusses it in conjunction with two others reported in the literature.

All three patients were males and adults. Their occupations were, respectively, laborer in a grain elevator, poultry huckster and store clerk. Special exposure is fairly clear in the histories of at least two of the three cases. The first patient gave a clear history of having cleaned out old wood from the bottom of a grain elevator a few days previous to onset of initial symptoms; the second patient was probably exposed constantly to fermenting starchy foods in his occupation as poultry huckster; the third patient was a credit clerk in a general store, but had to make trips out on farms at frequent intervals.

Symptomatology.—Initial symptoms in all three cases were hoarseness and cough, at first non-productive; later there were limited amounts of expectoration. In one case the sputum contained membranous shreds. The cough was severe and paroxysmal in all cases. The onset in one case was described by the patient as a "cold that settled in the larynx." Dyspnea was present in all three patients; two required tracheotomy. Dysphagia was present in two of the three. Progressive loss of bodily strength and weight were present in all three. The temperature was only slightly elevated in two of the patients, probably so in all three. Local subjective sensations of pricking and burning in the region of the larynx and trachea were present in two of the patients.

Pathology. Necropsy was not performed on the only patient who died. The regions involved besides the larynx were the pharynx, tonsil, trachea and lungs. The skin was involved only in one patient and this was a secondary extension after tracheotomy. Leukocytosis was evident in one patient, the count being 19,000. This was the patient in whom the pulmonary involvement was fatal. Minute abscesses are characteristic of the blastomycotic lesions. In the larynx, those of the ab-

PLATE XXXII.



Blastomycosis of the larynx.—Chevalier Jackson. *(Arch. Otolaryng.)*

The upper illustration shows a mirror view of the stenotic laryngeal lesion in a case of primary blastomycosis of the larynx. From an oil color drawing by the author.

The lower illustration is a tinted photograph of the front of the neck, showing the butterfly-shaped dermal lesion, the result of extension by continuity from the larynx after tracheotomy performed for blastomycotic laryngeal stenosis.

scesses that are superficial rupture on the surface, leaving an ulcerated spot among other as yet unruptured nodules.

Histology.—The histologic picture was suggestive of tuberculosis in all three patients. Inflammatory infiltration, proliferation of the epithelium, giant cells and minute abscesses were present. The characteristic in all three was the presence of spherical, encapsulated parasitic cells. They were demonstrated in the tissues in the three patients. Mycelia were not present in the tissues.

Bacteriology.—The sputum was scanty in all three cases, but the blastomyces were demonstrated in smears of sputum or secretions. Mycelia were demonstrated in the sputum of two of the patients.

In considering laryngoscopic appearances, it may be well to remember that the stage of the lesion, or part of the lesion, is important. In the early stages it may be flat; the nodules and yellow or grayish points are minute, superficial abscesses. When the abscesses rupture, the lesion flattens at that point. Exudate may cover considerable areas of the lesion. In the author's case the opaline "frog-spawn" appearance of the tiny nodules was quite unlike anything else he had ever seen in the larynx. The mucosa that was not covered with grayish nodules was deep crimson, the intense redness being in marked contrast to the pallor so often seen in the pale type of laryngeal tuberculosis. The diagnosis can be made with certainty by biopsy, and bacteriologic examinations. It is an important fact that the blastomycotic organisms are not readily seen in stained sections, hence are likely to be overlooked unless unstained specimens are searched.

Complications.—Pulmonary involvement was slight in one patient and fatal in one. Extension to the skin surface was present in one patient. Palpable lymph nodes were absent in one patient, and were not noted in the others.

Prognosis.—One patient of the three died of the disease, one recovered, one is still under treatment and is progressing favorably.

Treatment.—The unfavorable results from surgical treatment of blastomycosis of the skin evidently influenced the three observers against surgery in their respective cases. The use of potassuim iodid is the method of choice, and has succeeded very well in the author's case.

Since writing this report the author has learned that a large number of these cases have occured in Peru.

Endothelioma of the Larynx. C. McDougall[3] reports the case of a 17 year old boy who complained of slight hoarseness and difficulty in breathing for four years. The symptoms had gradually increased until now he had to make a special effort at each inspiration.

Indirect laryngoscopy showed a large bluish mass below the epiglottis filling the larynx, obstructing a view of the vocal cords. An elevated mass of tissue was noticed on the left hypopharyngeal wall about 2 cm. above the laryngeal tumor.

On June 5, 1924, at Wesley Memorial Hospital the patient was given a general anesthetic for direct laryngoscopic examination. He became cyanotic several times while taking the ether. As he reached the third stage of anesthesia he stopped breathing and became very cyanotic. A low tracheotomy was done immediately, a tube inserted, artificial respiration given and in a few minutes he breathed freely.

A laryngoscope was introduced into the mouth and a firm sessile tumor could be seen on the left hypopharyngeal wall, just above the larynx, about six mm, in diameter. A large grayish tumor, cherry sized, protruded from the larynx. It was soft like a polypus but not pendunculated, attached to the left ventricle.

The laryngeal tumor was completely excised with

(3) South. M. J., April, 1926.

a laryngeal knife and it bled surprisingly little. The area was cauterized with a strong solution of silver nitrate. The patient recovered from this operation rapidly. A week later, a large section of the pharyngeal tumor was removed. The patient has been observed for a year since and has had no trouble except for a slight enlargement of the pharyngeal tumor, which was controlled by *x*-ray therapy. The pathologic diagnosis made from sections of the tumor was endothelioma and chronic inflammatory tissue.

Endothelioma must be differentiated from simple and cavernous hemangioma, varix, submucous hemorrhage, angio-fibroma and vascular tissue which occurs in the larynx. The cell nests of this rare neoplasm are formed by a proliferation of endothelial cells. The tumor is highly vascular, due either to pre-existing or newly formed vessels, the walls of which become thicker until at length the intra-vascular spaces are entirely filled.

Endotheliomata occur in the arachnoid and pia mater, and usually on serous surfaces but have been observed in the viscera, bone, mamma, and subcutaneous tissues. The parotid neoplasm known as "mixed tumor," is often an endothelioma. Endotheliomata not uncommonly assume a distinctly aveolar type. The large flat endothelial cells springing from the serous surface, and occuring within distinct alveoli formed of connective tissue, afford a picture so closely resembling carcinomata that accurate differentiation seems at times impossible. The shape, arrangement and character of the cells, associated with the poor development of blood vessels, point conclusively to the diagnosis of sarcoma.

Endotheliomata grow slowly, as a rule, manifest metastasis late, if at all, and show little tendency to recur if they are thoroughly removed. The high mortality from endothelioma is due to inaccessibility of the tissues ordinarily involved. The etiology is unknown.

The Treatment of Chronic Laryngo-Tracheal Stenosis. According to S. Iglauer,[4] stenosis of the larynx is usually secondary to ulcerative processes within the larynx. Paralysis of the recurrent laryngeal nerves or ankylosis of the arytenoid cartilages constitute additional causes in adults.

The nature and extent of the stenosed area can be determined by direct and also by *x*-ray examination.

Chronic cannula carriers are more comfortable if they wear a valvular speaking cannula.

Obstructive lesions should be removed after which prolonged treatment with either metal or rubber dilators should be employed. The prognosis for ultimate functional recovery is favorable.

Phantom Foreign Body of the Larynx. A woman, age 31 years, was seen by M. C. Myerson[5]. She had some degree of hoarseness and a croup-like cough at intervals during the past five years. When seen, she was suffering with laryngeal spasm and dyspnea in addition to her other previous symptoms; this had been so particularly for the past ten days. Indirect laryngoscopy revealed nothing definite, except that there was what appeared to be an abnormal bulge just below the anterior commissure.

Nasal examination disclosed both chambers fairly full of moderate sized polypi. Her general physical examination and examination of her chest were negative.

Roentgen examination of the laryngeal and upper tracheal region revealed a shadow, which was interpreted as that of a bone collar button.

The patient was laryngoscoped, but no foreign body was found. She was bronchoscoped to see whether the body had dropped down, but this too produced negative results. She was again *x*-rayed. The same shadow of a collar button was seen. Laryngoscopy and

(4) Ohio State M. J., March, 1926.
(5) Laryngoscope, March, 1926.

bronchoscopy were again performed, and when no foreign body was found, the idea of an area of calcification in the thyroid cartilage was thought of. Roentgen examination of the neck in a different position than that used the first two times, did not show the collar button shadow.

After this the patient's nasal condition received attention: the polypi were removed and ethmoid regions cleaned out. The cough, and dyspnea disappeared at the end of three to four weeks. The case illustrates that calcification of the laryngeal cartilages may simulate a foreign body, and that chronic nasal pathology may cause severe laryngeal symptoms.

Spontaneous Subcutaneous Rupture of the Trachea. A negress, aged 27, while waiting on the table suddenly experienced a sharp pain in the region of the trachea. She immediately noticed difficulty in breathing, which rapidly grew worse. At the same time, her throat began increasing in size, growing larger with each breath. J. W. Nixon[6] saw her thirty minutes after the onset of her trouble. On first sight, she appeared to have a large goiter occupying the entire space from the tip of the chin to the manubrium sterni. However, on examination, the tumor was soft and emphysematous, and felt very much like an air cushion. This mass became larger during expiration and smaller during inspiration. At this stage, the patient was breathing with much more difficulty and seemed to be in great distress.

The difficulty of breathing was relieved considerably a few minutes later when the skin, which had become extremely tense, ruptured at a point posterior to the angle of the right jaw, anterior to the sternomastoid muscle. A second rupture occurred on the under surface of the arm two inches from the axilla, and still another, the third, appeared within five minutes' time at the lower posterior border of the axillary

(6) J. A. M. A., Oct. 17, 1925.

space. At this time, the patient was literally breathing through these three openings in the skin.

An operation was performed under ether anesthesia. An incision was made, exposing the entire cervical portion of the trachea. This part of the trachea was found intact. A bloody froth was seen coming up from beneath the sternum, indicating a rupture within the thoracic cavity. Because of the patient's condition, a further exploration was not deemed advisable and a low tracheotomy was performed.

During the week following the operation, the patient had an elevation of temperature above normal, the highest being 102 F. The emphysematous condition, which had extended over the neck, right arm, the entire chest and the right axilla, had entirely disappeared at the end of fourteen days. However, a troublesome cough lasted for two months. A blood Wassermann test, taken before her departure from the hospital, was negative.

Zeuch, in 1922, made an exhaustive study of the literature, and tabulated all the cases of subcutaneous rupture of the trachea which had been reported up to that time. Only 53 cases could be found. It is interesting to know that of all the 53 cases mentioned by Zeuch, in every case with the exception of three the rupture was caused by a blow or a violent strain on the trachea. These three cases, together with the author's make a total of four cases occurring spontaneously. This patient had had a cough a few days prior to the rupture, but at the time it occurred, she was not coughing.

The chief point of interest in connection with this case is the need of immediate treatment and the method of so doing. As soon as the diagnosis is certain, an incision should be made through the skin in the midline over the trachea. This should be done without waiting for an anesthetic.

Contribution to the Technic of Endoscopic Removal of Larger Tumors of the Trachea and Larynx R. Gomperz[7] devised an instrument which is a combination of a grasping forceps and a loop. The guiding tube of the grasping forceps is combined with the guiding tube of the wire loop. The latter tube is 1 cm. longer than the former. The instrument is introduced with opened loop and opened forceps. The loop is placed around the tumor, the forceps is closed and the tumor is caught. The forceps is kept closed automatically. This method should be modified according to the seat and size of the tumor. Tumors with a long stem must be caught with the sling and, at a favorable, moment grasped with the forceps.

Globus Hystericus Frequently a Sexual Neurosis. J. B. Potts[8] reports a series of twelve cases illustrating this condition. From a study of the various treatises on the subject and his own personal experience the author believes that:

1. A true syndrome globus hystericus is a neurosis secondary to mental conflict.

2. This conflict is usually secondary to some mental trauma received from an act associated with, or a condition of, the reproductive organs.

3. No surgical procedure, other than passing a bougie, should be resorted to until the true etiology of the condition is ascertained and relieved by a competent neurologist.

The following case illustrates the above points: a male, age 21, waiter, single. Laryngorhinologic examination negative. Referred to Le Roy Crummer. Present complaint: six months previously had sore throat for one day. Left lump in middle of neck and soreness in windpipe. Feels heartbeat running up to ears. Scotch-Irish; Catholic; emissions; onanism.

The boy had been practicing masturbation for some

(7) Ztschr. f. Hals-, Nasen- u. Ohrenh., 13:3-15, 1926.
(8) Ann. Otol. Rhin. & Laryng., March, 1926.

time, but it was not until after he was told of injury to himself and the moral wrongdoing that he developed remorse and mental conflict resulting in globus. The condition was relieved by rational explanation and advise.

Spasm of the Glottis in Adults and Children. H. Barwell[7] states that a typical attack of glottic spasm begins with a tickling sensation in the throat, followed by a fit of coughing; the glottis then closes, inspirations are taken with difficulty and accompanied by loud stridor, but expiration is unimpeded. In the severest cases the glottis is completely closed at the height of the attack, the signs of asphyxia are present, and there may be, though this is rare, complete loss of consciousness. The spasm in this severe form lasts but a few minutes; in many cases it is less complete but lasts for several hours.

Though very alarming to the patient, glottic spasm is not dangerous, except when due to serious disease, such as locomotor ataxia or thoracic aneurysm; it is only in such cases that tracheotomy is ever required. The attack is generally too short and sharp to leave much time for direct treatment. The fears of the patient must be allayed as far as possible, and he should be told to try to take quiet, shallow respirations through the nose. The inhalation of nitrite of amyl frequently gives relief.

For the preventive treatment between the attacks, any exciting cause should be discovered and treated, particularly pharyngitis, chronic larygitis, over-indulgence in tobacco or alcohol, and indigestion; in some patients a spasm is readily induced by drinking cold fluids, which must then, of course, be forbidden. A general tonic and hygienic regime is indicated, and a change of air and scene is often of value.

Laryngitis Stridula.—In some children spasm readily occurs in the course of a catarrhal laryngitis, and

(7) Lancet, July 3, 1926.

produces the condition called *laryngitis stridula* or "false croup." The child has a cold with slight pyrexia and hoarseness, but during the evening or night respiration becomes embarrassed and inspiratory stridor ensues with recession of the ribs and epigastrium and, in some cases, an alarming degree of asphyxia. The symptoms tend to subside towards morning, but may be repeated during the next few nights, though nearly always with diminishing severity. The child must be put to bed in a warm but well-ventilated room. At the onset one or two grains of calomel should be given, and repeated in three hours, until the bowels have acted freely, and the drug may usefully be continued in half-grain doses three times a day; one minim each of tincture of aconite and vinum antimoniale may be given every two or three hours. If any dyspnea appears, an emetic is the best means of allaying the spasm and of clearing the bronchial tubes of secretion. When the child has recovered any predisposing source of irritation must be sought out and treated. In a large number of cases this is in the pharynx; in fact, children subject to laryngeal spasm nearly always have adenoids and enlarged tonsils, which must be removed; gastro-intestinal disturbances should receive treatment, and cod liver oil, malt, and preparations of iron are helpful during convalescence.

Laryngismus Stridulus.—There is another form of "false croup" in which there is no inflammation or other disease of the larynx; this is called *laryngismus stridulus*, and occurs in feeble, unhealthy children, usually between the ages of 6 months and 2 years, often in association with rickets, and nearly always with adenoids or enlarged tonsils. The attack is shorter and sharper than that of laryngitis stridula and, like it, often occurs at night. In a typical severe attack the child awakens suddenly struggling for breath, with inspiratory stridor, retraction of the lower ribs, and cyanosis. At the height of the attack air may com-

pletely fail to enter, and there may be convulsions, carpo-pedal contractions, and evacuation of urine. The end comes with a long crowing inspiration, and the child then generally goes to sleep. Death during an attack is very rare, but a feeble child may become worn out and die from pulmonary collapse.

Shorter and milder forms are more common, and are called by nurses "passion-fits." Laryngismus has usually been ascribed to spasm of the glottis, but a similar explanation may hold good for some cases; a child with nasal obstruction from adenoids becomes partially asphyxiated while asleep and, under the deep gasping inspiration which follows, the soft flaccid laryngeal walls are sucked in and close the lumen.

In the treatment of the attack, it must be remembered that it lasts but a few minutes, and that there is only time for rapidly acting measures. The quickest and most effective method is to pull the epiglottis forward with the forefinger passed to the base of the tongue. Others measures are to stimulate the conjunctiva by touching it with the finger, the lips by brisk rubbing with a towel, the face by cold sponging, or the nasal mucosa by tickling with a feather, or by smelling salts or inhalation of nitrite of amyl. There is no time for the hot bath sometimes recommended, nor for tracheotomy or intubation, which would in any case hardly ever be necessary. Of preventive treatment, the most important is the removal of adenoids and enlarged tonsils; overloading the stomach must be carefully avoided, and the bowels should be regulated.

Postdiphtheritic Stenosis of the Larynx. In this article H. B. Orton[8], in speaking of diphtheritis stenosis of the larynx, refers to the chronic type in which it has been necessary to reintubate the patient after a period of a month to six weeks.

These cases have been treated by various procedures: laryngeal bouginage has been done after trache-

(8) Arch. Otolaryng., June, 1926.

otomy; granulations have been removed; and finally laryngostomy performed when all other methods have failed.

The author's net results have been: seventeen patients decannulated and cured; three still under treatment (in one of whom it is necessary to perform a laryngostomy); one patient, a child, aged 2½ years, died of miliary tuberculosis six months after decannulization; another died in convulsions two years after decannulization, but with the fissure not closed (cause of death not known). These two deaths cannot be counted as deaths during treatment. Three other patients died from toxemia, not as a result of tracheotomy, as the case reports show. Altogether, tracheotomy was performed in twenty patients.

From his experience the author concludes the following:

Because of the long time necessary for treatment of these cases before they can be decannulized, should we not urge early tracheotomy in diphtheria rather than await the uncertain procedures of continued intubation?

The constant wearing of intubation tubes causes changes within the larynx.

The larynx will tolerate with less irritation apparatus covered with Penrose tubing.

Before any attempt was made to decannulate these patients, infected tonsils were removed. The influence of disease in all laryngeal cases is important, and the diseased tonsils, as well as any nasal infection, should be eliminated before any work is attempted.

Voice and Speech Disorders

A Method for Studying the Action of the Vocal Muscles During Phonation, With Some Experimental Results and Conclusions. The general conclusion from the present work of L. E. Dodd[9] is that external pres-

(9) Laryngoscope, June, 1926.

sure applied locally and rather abruptly either on the thyroid at any point, or on the trachea at any accessible point, causes a lowering in the pitch of a sustained vocal tone, while pressure on the cricoid shows no very appreciable lowering of the pitch, and almost invariably a rise in the pitch. This generalization is applicable to eight vowel sounds as given in Miller's vowel pyramid, and is limited for the time being by the scope of the present work, to two definite frequencies for each voice, one at about the center of the vocal range, the other a fourth below this. The direction but not the amount of the pitch change was determined. An incidental and brief quantitative study on only one subject, a mature bass singer, showed that in this single case the amount of external pressure, applied as stated above, necessary to bring about the pitch change, was about 75 to 100 gm. (approximately, a force of from 2½ to 3½ oz.).

The results indicate that further investigation of the voice in this manner will be justified by specific data capable of interpretation. A complete study is warranted that will include a considerable number of voices, both men and women, of all three of the principal types in each case (soprano, mezzo, contralto; tenor, baritone, bass), using different vowel sounds, such as the present list of eight, if not a larger list, and covering the whole vocal range, so that all "registers" are included. Also, other localities of the throat besides those on the median line should be investigated. For certain localities of the throat studied in this way it might be found desirable to restrict further the area affected by the pressure, through the use of a special mechanical device smaller in size than the fingertip.

The vocal mechanism, while apparently simple in its action, is in reality complex. Quite a number of different muscles control or affect the behavior of the vocal cords, and a somewhat different avenue of ap-

proach to their functioning, even though that approach is indirect, should be of value in the further study of a subject not completely understood.

Relationship of the Laryngologist to the Public Speaker and Singer. S. H. Large[1] believes the laryngologist may be of great service to speakers and singers. Vocal teachers often send their pupils to a laryngologist for an operation to improve the voice. In a great number of these, there are no conditions present which need operative interference.

Proper breathing is one of the most essential factors in singing. The amount of air going through the glottis is sometimes not properly controlled so that a strong blast is often thrown against the cords causing a considerable strain on them. Rather than striving for purity of tone, maximum intensity of sound is sought for. The cords are sometimes over-stimulated by the effort to produce sounds and pitch higher or lower than normal. This is seen when a natural baritone is made to sing tenor, or vice versa. A cause of fatigue of the voice is too much singing at one time, or singing after a heavy meal when the breathing is interfered with, due to the fact that the function of the diaphragm is somewhat limited. Most good vocal teachers recommend a rest of the voice one day in every week.

One must be very careful in operating on the nose and throat of a singer. The voice accustoms itself to pathological conditions which may be present there and changing these may alter the voice considerably. The author believes that tonsillectomy has a tendency to lower the pitch of a singing voice and he has refused to operate on a prima donna for fear of affecting the voice. If any operation on the nose or throat of a beginner is absolutely necessary it should be as conservative as possible.

Preachers and public speakers get into the habit of faulty voice production or wrong voice placement, and

(1) Ohio State M. J. January, 1926.

use it not only when making speeches but also in daily conversation. Most of these either pitch the voice too high or try to utter too many words in one breath. The undue force necessary in exerted articulation causes a strain on the muscles of the throat which results in fatigue and pain in the throat and tremulous and uncertain tones.

In monologists and vaudeville singers acute inflammatory conditions in the throat frequently occur, which as a rule receive very little attention. They continue to use the voice once or in most cases twice a day while the acute process is present. This together with their mode of living, their dressing in draughty rooms, and sometimes the abuse of tobacco and alcohol, give no chance for resolution, so that the cords become very much thickened and then little can be done to restore the cords to their normal state. When the cords have become chronically thickened something must be done to prolong the singing or speaking voice of these entertainers. They cannot be asked to quit their work in the middle of a season, but they can aid the voice by avoiding unnecessary conversation, by singing only in the low register, and by "faking" the high notes. Their habits of life must be changed somewhat. Dusty and smoky atmosphere must be avoided.

Singers nodes are the result of an inflammatory thickening at the point of most active vibration of the cords, especially when the voice is over-strained by singing at too high a pitch. Removal usually causes the voice to clear up but in some cases it is no better after the operation because there are chronic inflammatory changes in the underlying muscles and in the elastic tissue of the cords. If the nodes are not far advanced they can be cured not by rest or operation but by regulated humming exercises.

Prolonged singing of too high notes or the sudden effort to reach a very high note will often produce a submucous hemorrhage of the cord. The voice of one

singing falsetto is usually shortlived because of the abnormal use of the anterior third of the cords, while the posterior third is not being employed.

During the period that any acute inflammatory condition is present in the nose and throat of a singer absolute rest of the voice should be demanded. This period of rest should be prolonged for sometime after the inflammation has subsided.

Various throat lozenges are of very little help. Oily sprays should be condemned as they tend to give only temporary relief, and singers may rely on them when the voice should have complete rest. Mild astringents, like weak solution of zinc chlorid and silver salts, are of some help. Vaporization of iodoform in ether is beneficial in the acute and subacute inflammations. Medicated steam inhalations with cold applications externally give relief to many. Late in the course of the inflammation the use of the galvanic current aids in resolution. In any of the inflammatory conditions rest of the voice should form 90 per cent. of the treatment.

Singers Nodes and Voice Disturbances. Sokolowski[2] does not agree with Flatau that nodes may be temporary disturbances, but believes there is always some pathologic substratum. Imhofer's statement that all his patients recovered by rest and local applications alone, is not corroborated by the author's experience. He believes that all subjects who do not respond to two or three months' rest should be operated on, and the use of the voice in singing "over" the difficulty results in permanent injury which cannot be restored by operation. Rest not only of the singing voice but also of conversational voice, is indicated; otherwise it is useless.

The Function of the Soft Palate in Singing. In considering this subject L. D. Rabotnoff[3] comes to the following conclusions:

(2) Ztschr. f. Hals-, Nasen,- u. Ohrenh., 12: 246, 1926.
(3) Ztschr. f. Hals-, Nasen- u. Ohrenh., 11:546, 1925.

1. The task of the soft palate in singing consists of separating the oral cavity from the nasal cavity and the nasopharynx. The more complete this separation is, the more favorable are the conditions for the resonance of the oral cavity.

2. In the best singers, the nose with its cavities and the nasopharynx does not represent a part of the voice apparatus in singing vowels and consonants (except the nasal ones).

3. The inclusion of the nose as a resonance apparatus influences the sonorousness, strength and timbre of the voice very unfavorably, forcing and fatiguing of the same.

4. Most singers use the nose and the nasopharynx for voice formation. They do this at a disadvantage, because the fundamental qualities of the voice suffer. They use this resonance apparatus without rules. They include the same at times, and at times they exclude it.

5. The sounding (humming) in the nose is missing, not only when the palate shuts off the nasopharynx completely, but also when the gap behind the soft palate restrains itself to a certain minimum.

6. The participation of the nasal cavity and the nasopharynx in the formation of consonants leads to an indistinct pronunciation.

7. By pulling up the soft palate while singing vowels, the production of tunes of a certain timbre is accomplished, which is controlled by the ear.

8. In order to acquire a sound without nasal resonance, it is advisable that singers make use of artificial obturators of the nasopharynx for a short while.

9. Curvatures of the nasal septum and other anomalies of the nasal cavity have not a bad influence on the tune of the voice if they are not accompanied by symptoms of inflammation of the upper respiratory tract.

10. In deep inspiration, with great expansion of the

thorax, the soft palate has the tendency to move downward.

Mechanics of Vocal Cord Vibration, and of Snoring. According to Tonndorf[4] a stream of liquid, air or gas passing through a tube and encountering a narrowed place increases in speed with corresponding loss of pressure, even to a minus pressure, causing a "sucking in" at the point of greatest constriction. The mathematical formula of this proces is given. Illustrations of this principle are the steam injector and the atomizer.

In the larynx, the same physical conditions are present, namely, the conical narrowing below the rima glottis. When the cords are in the position of phonation, the air stream first forces them apart, and as the narrowed stream passes through under increased speed but decreased pressure, the cords are sucked into-gether again, and the rapid repetition of this process produces sound. Elasticity of the cords is not necessary for mere sound, but functions in the production of pitch, modulation and clarity of tone.

The same explanation applies to snoring, which occurs when relaxation of the soft palate permits the inrushing air to suck it against the tongue if the mouth is open, or against the pharyngeal wall in nasal breathing when the passages are sufficiently narrowed.

A Speech Clinic Case with Misconduct as a By-Product. Herman H. Young[6] discusses the necessity of making an exact diagnosis in cases of speech disorders. He reports a case of a little girl, seven years old, who had a most pronounced speech defect. He states that she was brought to the clinic by an aunt who reported that when the child was three years old, while riding in an automobile with her family, a train struck the auto and killed all other members of her immediate family. She was thrown a distance of about one hundred feet

(4) Hals-, Nasen- u. Ohrenh., 12:241, 1925.
(6) J. Applied Psychol., December, 1925.

and was considerably bruised but not seriously injured. The patient had never been able to talk distinctly. The aunt says that she had tried every means she could think of to help the girl but had not been able to produce any effects upon her speech. Two physicians had been consulted. One told the aunt that the girl's speech was a matter of habit, that there was absolutely nothing wrong with the child and that she would learn to speak properly when she went to school. The other said that the girl could never be expected to speak properly because for some reason the nerve of speech was undeveloped.

At the time the girl entered school her defective speech was explained by the aunt. A year later both the principal and first grade teachers reported that they could not teach the child to speak properly and the aunt was inclined to feel nothing could be done for her speech. She said, "Not one single word of her reading could be understood." She pronounced her own name and address very imperfectly.

The child first met the examiner in his class of clinical psychology. She was given the Stanford Revision of Binet test together with performance tests to determine her general mental level and to get an index of her powers of observation, attention, imageability, attention span, and ability to learn. She was diagnosed as of slightly above average normal mental ability. During the entire period of the examination the speech was studied very carefully. The examiner was convinced (1) that there was no serious physical deformity present (2) that her unintelligible speech was the result of improper speech habits and (3) that if the known laws of learning and habit formation were intelligently applied she could easily learn to speak correct English. The success in a case like this depends upon the ability of the instructor to make a correct diagnosis of the condition and then to direct the overcoming of a wrong set of habits and the building up

of a correct set by direct and easy guidance of the learning process. This means that no absolute method is applicable and that the effectiveness with which success is achieved will depend upon the teacher's ability.

The child's rapid acquiring of the English language was due to several facts.

1. That she had English meanings and comprehensions, but imperfect pronunciation.

2. That her condition was correctly diagnosed at the beginning and correctly re-diagnosed at every step of the instruction.

3. That she was therefore instructed from the beginning according to known laws of learning and of habit formation with the instruction always aimed directly at the needs indicated by the re-diagnosis of her progressively improving speech.

4. That she was of normal mental ability somewhat above the average.

5. That she was so conscious and painfully aware of her unintelligible speech that she came with an intense desire to learn to speak correctly.

6. That this desire to learn persisted throughout the learning period because for the first time in her life her efforts to learn to speak correctly were being crowned with real success.

7. That the aunt who stayed with her during every period of instruction learned enough about the difficulties and the methods of overcoming them to give intelligent and effective help between periods of regular instruction at the clinic.

[There are numberless patients of this type which present themselves. They are classified as cases of idioglossia. This condition is not associated with weakness of intellect although there is often a family history of insanity. It is not associated with any malformation of the organ of speech.—Ed.]

Disorders of Speech. In this article Smiley Blanton[5] discusses delayed speech as follows:

The normal child begins to use voluntary speech when it is about 15 months old. If speech is delayed a year beyond this time the child should be examined by a physician who is familiar with nervous diseases. The four common causes of delayed speech are:

1. *Lack of Mental Development.*—The brain must be normal in order that the child may develop speech. Sometimes the brain is injured through accident or disease, and speech does not develop. If the injury is discovered early and treatment is instituted, speech may be improved, but if the child is left untreated for several years after the injury, the chances for improving speech are very remote.

2. *Lack of Necessity for Speech.*—Speech developed in response to definite needs. If the child has too much done for it, speech is delayed or the speech is a jargon which no one but the parents can understand. Such children may be made to talk by refusing to give them what they want until they make an attempt to ask for it.

3. *Continued Illness with Extreme Malnutrition During Infancy.*— Speech disorders caused by illness or malnutrition should be referred to the physician for treatment. Such cases are not common.

4. *Unhealthy Emotional Attitudes.*—We find children who are extremely negativistic and who refuse to talk, and develop a condition of mutism. Sometimes we find even young children with emotional attitudes that are similar to those which we find in older people, whom we call hysterical. Here there is a definite emotional conflict which shows itself in a physical symptom, causing the child to refuse to speak. Such cases need careful study and training, and in nearly every such case the home conditions must be modified.

The Mechanism of Speech and Deglutition in Pro-

(5) Minnesota Med., January, 1926.

gressive Bulbar Palsy. As a result of their study at the National Hospital for the Paralyzed and Epileptic, London, Macdonald Critchley and Charley S. Kubik[7] give their analysis of speech as follows:

In attempting to analyze the phenomenon of normal articulated speech it is necessary to isolate the various component mechanisms and to deal with each one separately. The basis of all speech is primarily a production of sound or phonation. This is accomplished by the passage of a current of air through a tubular organ, the lumen of which is partly obliterated by a diaphragm-like structure. The essential organ of normal phonation is therefore the lung, an apparatus capable of expelling a blast of air. The trachea and upper air passages, including the nasopharynx, act as the primitive resonating tube; the imperfect diaphragm is formed normally by the adduction of the more or less mobile thyroarytenoid ligaments, or vocal cords.

It is noteworthy that a larynx is not essential for the mechanism of phonation. Complete recurrent laryngeal nerve paralysis, division of both vagi, or extirpation of the larynx, does not produce aphonia. It is common knowledge that speech of a certain character is possible in the absence of the larynx. In these instances articulation was perfect; the speaking voice was rather quiet and toneless in character but normally modulated, and singing was possible even over a range of more than two octaves (from 60 to 260 vibrations per second). The bellows apparatus producing the sounds in such cases is formed by the stomach and esophagus, the positive air pressure being brought about by deglutition or by inspiration; speech always takes place during the expiratory phase and therefore long sentences cannot be enunciated without the patient pausing to replenish his bellows.

The simplest component of speech therefore consists

(7) Brain, December, 1925.

in phonation of a toneless type and exists independently of the integrity or complexity of the larynx.

Aphonia from Goiter. It is the belief of J. W. Shuman[5] that loss of voice is a rare condition when it is caused by pressure of the thyroid gland. R. C. Coffey does not remember having had a case of aphonia which was relieved by the removal of a goiter.

G. W. Crile says: "About 4 per cent. of our cases show a unilateral paralysis and often present some difficulty in speech but usually are thoroughly compensated. With the exception of malignant cases I have never had a case with complete loss of voice. The functional side of such a case must of course, be considered. A laryngoscope examination would clear up this point."

E. S. Judd cannot recall a case of this sort except one or two in which there was a hysterical aphonia which was relieved by operation: these, however, showed no definite paralysis of the cords on laryngoscopic examination.

The author reports the case of a man, aged 30, who was admitted, May 28, 1925, to the service of the throat clinic with the complaint, loss of voice, of two months' duration, which had come on gradually.

The patient continued to lose weight until July 2, when, during consultation, a definitely enlarged thyroid was found and given as a cause for the aphonia.

The patient was nervous: he had tachycardia: the palpebral fissures were wide: the upper lids lagged: the pupils were dilated: the skin of the face and neck was cyanotic: effort increased the symptoms: when he attempted to speak, the superficial jugulars were visibly distended and the base of the neck ballooned, most markedly on the right side. Roentgen-ray findings were: increased density in the soft tissues in the thyroid region: lower poles on a line with the third dorsal vertebra. Major Frisbee found in the chest a

(5) J. A. M. A., June 26, 1926.

dilatation of a bronchus on the right side, evidently due to obstruction and pressure from without.

On July 14 there was found general congestion of the larynx and trachea; the cords moved well, and the aperture was symmetrical in all positions. The cords gave evidence of some thickening. July 28, marked subglottic inflammation was noted with thickening of the mucosa extending into the trachea—a definite tracheitis.

September 17, both lobes of the thyroid were removed and the isthmus resected, sufficient thyroid being left next the trachea to take care of physiologic function. The capsule of the thyroid was firmly adherent to the gland, and the two lobes extended around the trachea posteriorly; with much difficulty the capsule was freed and the lobes were delivered. The pathologic report was "hypertrophy of the stroma, exophthalmic goiter."

The patient recovered his voice during the operation. His convalescence was uneventful and he was discharged, September 29, stating that he felt fine. His voice was clear, with good tone and he had no difficulty in breathing or deglutition.

Aphonia. In discussing the etiology of this condition W. R. Watson[1] mentions the following possibilities:

1. Tuberculosis is the commonest cause; that is, of the comparatively permanent aphonias. As a matter of fact, acute catarrhal laryngitis is the most frequent cause of all, but as this condition is limited to only several days' duration, it does not come within the purview of this paper. Tuberculosis may act locally on the cord or ventricular band to cause aphonia, or, by distortion of the arytenoids by means of edema or tumerous tubercles, may prevent the cord from approximating.

2. Syphilis is a common cause. It may act locally or indirectly; indirectly by pressure of a syphilitic

(1) Arch. Otolaryng., July, 1926.

tumor on the cortical centers, or on the trunk of the tenth cranial nerve, or on the recurrent laryngeal, or even on the terminal endings of the latter in the larynx, though this is rare. Unusual conditions resulting from syphilis are the aphonias noted in locomotor ataxia and paresis of the cortical centers from a broken down or softening gumma.

3. Benign or malignant growths around or on the vocal cords is a fairly frequent cause, though in the majority of these cases the patients do not wholly lose their voices. They usually speak in a husky or whistling tone, which is so characteristic that the condition is often diagnosed without examination. The ordinary papilloma is the most frequent offender.

4. Paralysis of the intrinsic muscles of the larynx through neuritis of the controlling nerves, caused by a focal infection, or by pressure on the trunk of the pneumogastric or recurrent laryngeal nerves by pericardial or pleural effusions and mediastinal growths, or by aneurysm of the arch of the aorta, or even by a hypertrophied thyroid gland, as well as by enlarged glands in the neck or tumors of the esophagus.

5. Paralysis of the cords or intrinsic muscles in certain forms of infectious diseases, such as typhoid fever and diphtheria, which, while not permanent, are at times of several weeks' duration. The aphonias found in the exanthematous diseases are as evanescent as those in acute catarrhal laryngitis.

6. A rare cause of aphonia would be embolism, causing an infarct in the cortex of the brain, or apoplexy in the same area, or a tumor, mild or malignant, pressing on the cortical centers governing the muscles of the larynx.

7. Shock, from concussion of the brain, as from a blow on the head, providing it causes incoordination of the centers in the cortex; or from a fractured skull lacerating the trunk of the tenth nerve, or from a lacerated wound in the neck, or an incised wound,

such as would be made in a thyroidectomy, causing trauma of the motor nerves of the larynx.

Besides the organic causes for aphonia, the latter condition may be found in almost any neurosis.

Three cases are reported by the author. The first was a man, aged 62, who had become hoarse several months previously, and for no apparent reason and without any pain on swallowing or cough. Examination revealed a tumor between the arytenoids which proved on section to be tuberculous. The second case was a man, aged 20, who also complained only of the aphonia. Examination revealed a markedly swollen right ventricular band. Physical examination of the chest was practically negative, as was also the sputum. However, with a slight daily rise in the temperature the author believes the condition to have been tuberculous.

The last case was that of a woman, aged 60, who complained of aphonia and cough following a cold ten weeks previously. Laryngeal examination revealed a paralysis of the right vocal cord. The Wassermann reaction was 4 plus. Neurological tests showed bilateral involvement of the eleventh and twelfth and unilateral involvement of the tenth cranial nerves, central in origin. While not positive of the diagnosis, the author believes the cord paralysis could quite possibly be from a central syphilitic lesion. Intravenous medication of fifteen doses improved the patient's condition only very slightly.

Bronchoscopy and Esophagoscopy

Foreign Bodies in Air and Food Passages.; With Special Reference to Those Not Casting *X*-Ray Shadows. In reporting seven illustrative cases, E. L. Myers[6] comes to the following conclusions:

1. Negative *x*-ray when associated with a history of something being aspirated or swallowed, especially

(6) Illinois M. J., March, 1926.

in the presence of physical disturbance indicate the proper use of the bronchoscope or esophagoscope.

2. A chest examination, properly made, will correlate in the successful diagnosis of negative *x*-ray foreign bodies.

3. Too hasty diagnosis of purulent bronchitis, pneumonia, edema of lungs and the like should not be made. Even failure to find foreign body does not preclude the fact that one does not exist hidden.

4. Persistent discomfort on swallowing, associated with declined physical powers is suspicious of retained esophageal foreign body.

5. Anterior-posterior pictures for esophageal foreign bodies, are apt to hide the foreign body.

The Problem of Tracheobronchoscopy and Esophagoscopy. T. Matsui[7] reports 26 cases of foreign bodies in the air and food passages occurring in Japan. The author presents a detailed history of each case and also a reproduction of the foreign body. The nature of the foreign bodies were: Fish-bone, 2 cases; tooth-plate, 6; one sen copper coin, 2; five fun Corean coin, 1; five fun Chinese coin, 1; ten fun Chinese coin, 3; twenty fun Chinese coin, 1; button fastener of Chinese cap, 1; tin whistle, 1; plug, 1; gold ring, 1; pin, 1; ear-rings, 1; stopper of beer bottle, 1; Go-ishi, 2; and five sen Japanese nickel coin, 1.

Location: 23 cases were in upper constriction, one case each in second and third constriction and in entrance of esophagus.

Fourteen cases were under ten years of age, six cases female and seventeen male.

In China there is a superstitution that swallowing gold causes death. Such accidents occur often in the case of married women.

The author reports two cases of repeated hemoptysis which on examination were shown to be due to dilated blood-vessels on the anterior wall of trachea

(7) Laryngoscope, February, 1926.

about at the level of three or four rings up the carina. The cauterization (trichloracetic acid) of the blood-vessels was sufficient to cure the hemoptysis. The author has termed the condition spontaneous tracheal bleeding and fears that often bleeding is mistaken as a bleeding from the lungs. The disease is only diagnosed and treated with tracheoscopy.

Difficult decannulement following diphtheria occured in three cases. The difficulty was due principally to the increase of granulation masses at the site of the tracheotomy tube. The tracheoscope through the mouth exposed the granulations and pushed them into the tracheotomy wound where they were removed. After two to three such treatments decannulement without asphyxia was possible, except in the third case, where lower tracheotomy was added. Upper tracheotomy had been performed originally in the three cases.

The author records a case of a Chinese male, aged 42 years, who complained of a cough of two years' duration, often with blood in the sputum. Examination revealed a papilloma in the inferior part of the trachea. This was removed and the symptoms subsided, and have remained so for the past year.

The Bronchoscopic Treatment of Bronchial Asthma and Chronic Bronchitis with Case Reports. On numerous occasions J. P. De River[8] has had the opportunity to insert a bronchoscope during the height of an asthmatic attack.

In performing bronchoscopy, he first anesthetizes the postpharynx, epiglottis, vocal cords and passes the swab well down into the trachea, using 10 per cent. cocain. A Jackson bronchoscope, aspirating type, is then introduced and, through this instrument, one is able to remove any exudate that is adhering to the walls of the trachea and bronchi and to make accurate, direct aplications to all inflamed hyperemic areas, as well as to atomize the entire tracheobronchial tree

(8) M. J. & Record, Feb. 3, 1926.

with a medicated solution. The writer has been using adrenalin inhalant, which is an oily solution and very soothing to the mucosa. For local application to the hyperemic areas, best results have been obtained with 10 per cent. silver nitrate solution, although argyol and silvol have been tried.

The bronchoscopic picture encountered, especially during or immediately following an attack of asthma, is as follows: there is generally a thick mucopurulent exudate, strongly adherent to the walls of the trachea and bronchi, with one or more inflamed areas or patches, the favorite site at or near the bifurcation of the trachea. In every case, which was bronchoscoped during an attack, the mucosa presented a swollen or waterlogged appearance, and upon inserting the bronchoscope and applying adrenalin solution, there was an almost instantaneous relief experienced, with a rapid cessation of the attack, followed by copious expectoration of thick tenacious sputum, which lasted for several days. In all asthmatic cases under treatment, it has been the author's experience to find an accompanying bronchitis. Whether the bronchitis was the cause of the asthma, the result of it, or whether the two are interdependent, cannot be stated definitely. But, from observation the author is inclined to believe that the two are interdependent conditions and that the bronchitis should be treated, even though the asthmatic attacks have been completely eradicated.

The bronchoscope is of great value in the treatment of chronic tracheobronchitis after the internist has exhausted his efforts to relieve the patient. Many cases may be benefited by bronchoscopy plus medical treatment, including the administration of vaccines. In a series of 28 cases, a large percentage was the result of inhalation of mustard or phosgene gas, and the remainder the result of influenza.

The bronchoscopic picture observed, upon examination of patients whose ailments were the result of gas

inhalation, is vastly different from those with bronchitis following influenza. In the gas series, the entire tract, from the larynx down, presented a beefy red appearance, highly injected. The tracheal rings standing out prominently and intensely white, furnished a marked contrast to the injected mucosa. Usually there is a profuse mucoid exudate covering the walls of the bronchi, with scattered areas of scar tissue. The series of bronchitis cases following influenza show a different picture. Here, the mucosa is of a bluish gray appearance, with areas of old fibrosis. The lumen of the bronchi are generally diminished in size, due to what is an apparent edema. The secretions are profuse and usually of a mucopurulent character. There seems to be a loss of muscular tone, and an interference with ciliary action, which allows the secretions to stagnate. Much good can be accomplished in these cases by bronchoscopic drainage and local applications of a solution which will stimulate the mucosa and cause shrinkage of the lumen of the smaller bronchi. And, by aspirating, we are able to remove the excessive secretions, thereby allowing the lung to be properly aerated.

Bronchoscopy is only an adjunct in the treatment of the above conditions. Rest, climate, hygiene, diet, vaccines and elimination of all foci of infection play an important part, and should be carried out along with the bronchoscopic treatment. The author reports a series of cases illustrating the points mentioned.

The Upper Lobe Bronchoscope. The resiliency and mobility of the tracheobronchial structures are the principle properties that make bronchoscopy possible. With this in mind, M. C. Myerson[9] has developed a straight tube instrument with which it is possible to expose the lumen of the upper lobe bronchus. (Fig. 34).

A 5 mm. and a 7 mm. Jackson bronchoscope were utilized as the basis for the new instrument. The floor of the bronchoscope was fitted with a sliding rod (A),

(9) Laryngoscope, March, 1926.

to the distal end of which was attached a flat spatula end (B), one-half inch long and one-eighth or one-sixth of an inch in width. The small spatula end can be removed by unscrewing the sliding rod from it. The proximal end of the sliding rod was fitted with a thumb plate (C), so that the spatula end, which is hidden in the floor of the bronchoscope, can be advanced when required, by pushing in the thumb plate. The light carrier was placed into the side of the tube, so that during its passage the light comes either from the roof

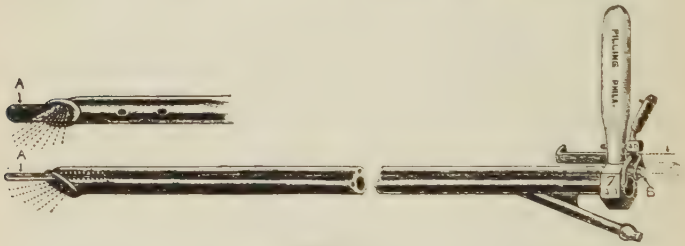


Figure 34.

or floor of the bronchoscope. This lighting arrangement was necessary because the floor of the bronchoscope was utilized for the sliding rod.

The instrument is used as follows: The bronchoscope is passed down to the upper lobe bronchial orifice. The upper end of the lip is brought into contact with the proximal wall of the upper bronchus. The upper wall of the main bronchus is now raised by the roof of the bronchoscope so as to bring the distal wall of the upper bronchus into view. When this is plainly seen and it is therefore above the level of the floor of the bronchoscope, the sliding spatula is slowly pushed out by means of the thumb plate and brings the distal wall of the bronchus from a more or less vertical to a more or less horizontal position. This in turn brings the entire bronchus into the same plane as the bronchoscope. This procedure exposes the upper lobe bronchus in its entirety and the main bronchus can be plainly seen.

Bronchoscopy in this manner is more readily performed with the left upper bronchus, because of its more horizontal position.

Report of a Case of Emphysema of the Neck and Chest (Pre-Operative), Following Inhalations of a Piece of a Nut. The patient, a boy aged 2 years and 9 months had a history of having a coughing attack while eating nuts three days previously.

On day of admission the boy had a temperature and clinical signs of a lung condition. An *x*-ray gave the picture of an infiltrative process extending along the roots toward the right base. An emphysematous condition of the lower right side was also noted, suggesting partial obstruction in the main bronchus. When seen by H. H. Forbes[1] on the same day, the child looked sick. At this time there was a marked subcutaneous emphysema involving the middle and both sides of the neck and extending down to the upper part of the chest anteriorly. It made the author at first doubt the statement that no operative procedures had taken place. This is the first case of this condition coming under his notice and he wishes to emphasize it as being pre-operative. The same day a bronchoscopy was performed. A 5 m.m. Jackson bronchoscope was passed, a mass seen and with the grasping forceps, three particles of nut removed. Suction was then used and a few fragments were found in the drainage bottle. Time: fourteen minutes. A rather stormy ten days followed, but the child recovered. The author believes there must have been a rupture of a small pulmonary vesicle with the subsequent leakage into the mediastinum and into the tisues of the neck.

Foreign Bodies in the Tracheobronchial Tree. Report of Cases in Which Bronchoscopy was not Done. Eleven cases of spontaneous recovery of foreign bodies are reported by L. H. Clerf[2]. Considering these few

(1) Laryngoscope, March, 1926.
(2) Ibid.

fortunate instances (Pl. XXXIII) as compared to the great majority where the object is not expelled. the author comes to the following conclusions:

1. The chances of spontaneous expulsion of a tracheobronchial foreign body with recovery of the patient are at best not more than 3 per cent.

2. So long as the foreign body remains in the air passages there is: a progressive increase in the pathologic processes; danger of complications; an increase in the difficulties attending the removal of the foreign body; and in certain cases the ever-present danger of asphyxiation.

3. Careful bronchoscopy for tracheobronchial foreign bodies gives over 98 per cent. of successful removal with recovery.

4. Under such conditions it is fair to assume that no well informed person would advise waiting with the vain hope that the intruder will be spontaneouly coughed up.

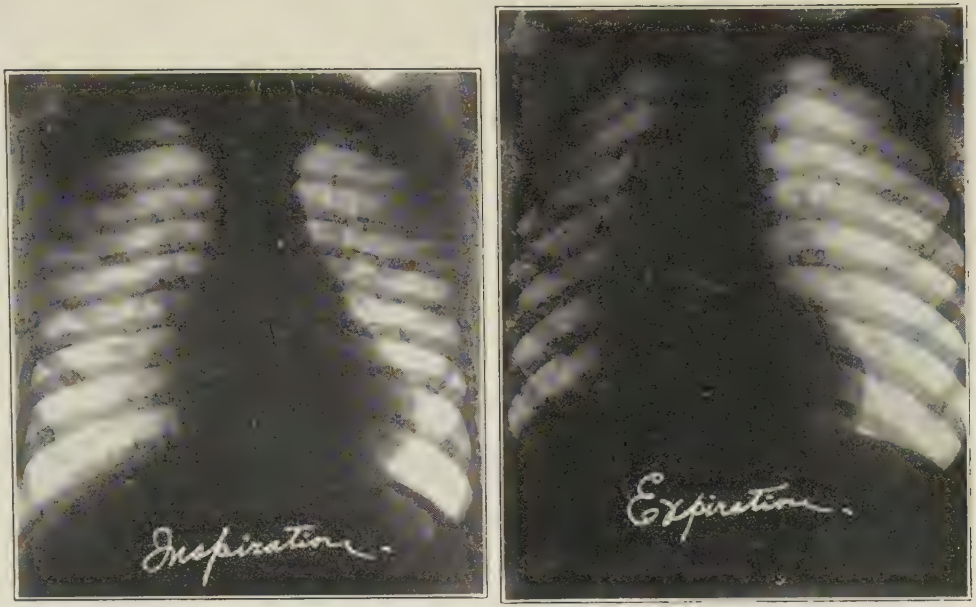
5. After rather extensive study of this subject the views arrived at confirm those of Chevalier Jackson and in advising patients or the family it would be well to recall his dictum, which applies with as much force today as it did when first stated, namely:

"We do full justice to our patients when we tell them that while the foreign body may be coughed up, it is very dangerous to wait; and, further, that the difficulty of removal increases with each hour the body is allowed to remain."

Lipiodol in the Diagnosis of Bronchopulmonary Lesions by the Bronchoscopic Methods. As a result of a study of 50 cases D. H. Ballon[3] concludes that:

1. The bronchoscopic method of injecting lipiodol is safer and more satisfactory than any other method by virtue of the added diagnostic advantage from having observed by direct vision the actual condition in the bronchi and lungs.

(3) Arch. Otolaryng., Mary, 1926.



Roentgenograms of the chest made by W. F. Manges at the end of inspiration and expiration in the case of a boy, 8 years of age, who choked on a piece of apple. Dr. Manges reported that there was very positive evidence of obstructive emphysema of the left lung, indicating the presence of a nonopaque foreign body in the left main bronchus. This was corroborated by the findings on physical examination. The foreign body was coughed up during the night. The roentgen ray studies and physical findings made on the following day showed that there was no interference to air entering the lungs. (Cierf, page 493.)

2. The quantity of lipiodol injected varies from 10 to 40 cc.

3. The topography of normal trachea and bronchi are clearly shown, and stand out in marked contrast to the pathologic.

4. Bronchial stenosis is recognizable.

5. True lung abscess which remains either partly or wholly unfilled, is readily differentiated from a bronchiectatic abscess or a tuberculous cavity which fills readily.

6. Bronchiectasis is diagnosed at a glance. This is especially important in lesions of the left base masked by cardiac shadow in which the ordinary roentgenogram failed to show even a large abscess.

7. In pulmonary tuberculosis, cavities are localized; the presence and extent of associated bronchiectasis and normal lung are demonstrated.

8. The thoracic surgeon has a useful means of deciding whether or not to operate, the extent of operative interference, and the prognosis.

9. New growth of the bronchus must be diagnosed bronchoscopically. Lipiodol is only an aid.

10. Bronchial fistulas and empyema cavities are clearly defined.

11. Respiratory studies show the changes occurring in the bronchi and bronchioles during respiration.

12. Studies of the act of coughing illustrate how, during a spasm of coughing, the lipiodol or infected material could be projected from the lower lobes and disseminated throughout the entire lung even at the apexes.

Bronchoscopic Removal of Safety-Pins. Sixteen methods of removal are discussed by Chevalier Jackson[4].

1. Buckling the pin into the mouth of the tube; suitable only for pins made of thin wire. Sisterhook or rotation forceps may be used.

(4) Arch. Otolaryng., Mar., 1926.

2. Breaking. This is difficult and usually unsatisfactory. All manipulation must be between instruments, not between an instrument and the patient's tissues.

3. Dismembering. The keeper can be removed in some pins. The spring clamp, present on some pins, may be removed if desired. Manipulations must be between instruments.

4. Cutting the pin on either branch close to the spring with Casselberry's cutter. This is not difficult to do, and eliminates all difficulty from the spring expansion, reducing the problem to that of two springless foreign bodies, one of them pointed. Cutting tissue must be avoided.

The foregoing four methods, involving mutilation of the pin, are less used by the author than the following methods of dealing with the pin as it is.

Preferable Methods. 5. Both ends sheathed in the tube mouth. The point is rested against the lip while the keeper is held against the tube mouth or lip of the laryngoscope, or esophageal speculum. The method is best adapted to pins not widely spread.

6. Version vertical to the plane of expansion. This is adapted to pins that are small in proportion to the passages invaded. Its mechanism is seized by the spring end and simply tumbled over. The version can be accomplished in the esophagus or bronchus, as in the stomach, if the pin is small. The rotation forceps are used for this.

7. Version in the plane of expansion. This can be accomplished even with large, stiff pins if the author's fundamental formula as to manipulation of all pointed foreign bodies, "Advancing points puncture; trailing points do not," is kept constantly in mind (Fig. 35). This form of version is also usually done with rotation forceps, and is the most frequently satisfactory of all methods.

8. Version, endogastric. This well known method is adapted to pins of even the largest sizes and stiffest springs. A clamp on the ring, which some pins have,

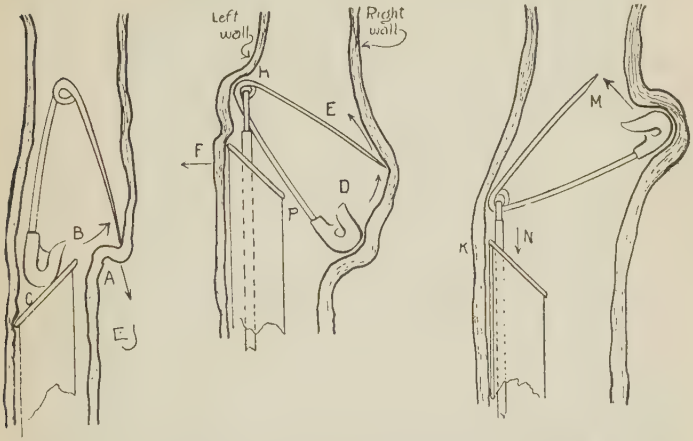


Fig. 35.—Version in the plane of expansion. Advancing the point as indicated by the dart *A*, which would occur if the keeper *C* (always the first part seen) was pulled on, would result in perforating the esophageal wall at *A*. The point is made to trail as indicated by the darts *D* and *E*. This is accomplished with the dull pointed rotation forceps. Assuming the point of the pin is to the right, strong pressure is made on the left tissue wall as shown at *F*, overriding the keeper with the tube-mouth, which is passed to the left of the keeper. As soon as the ring of the spring *H* comes into view the dull points of the rotation forceps are closed into it. Still bearing strongly to the left, as at *K*, traction made in the direction of the dart *N* will rotate the pin causing the point to trail as at *M*. Sometimes it is necessary to start the version in the desired direction by a little counterpressure with the tube-mouth *P*. Sometimes the jaws are passed down over the keeper branch, but usually the ring is exposed and grasped as here shown. It is sometimes advantageous to go anterior or posterior to the keeper in getting an exposure of the ring of the spring. This method is sometimes used fluoroscopically. It is a dangerous procedure, exceedingly so unless the double-plane fluoroscope be used.

may render this maneuver unsatisfactory. The clamp, if present, will show in the roentgenogram.

9. Straightening. This is based on the fundamental formula of the trailing point. Its execution has been greatly facilitated by the recent addition of the roller suggested by Willis F. Manges. The rotation or the sisterhook forceps are used because of the security of their hold on the keeper.

10. Dangling. A safety-pin seized rigidly, even if caught by the keeper, will cause the point to puncture. If caught by the keeper with rotation forceps in such a way as to dangle freely, the point will not be likely to puncture. This method is adapted to pins whose pointed branch is not longer than the transverse diameter of the invaded esophagus or air passage.

11. Point sheathed method. This is adapted to saftey-pins of even the largest sizes and stiffest springs. The Gabriel Tucker tack and pin forceps have rendered this manipulation much easier than was the case with side-curved forceps.

12. Point sheathed with the Mosher trap-door esophagoscope, or bronchoscope. This is adapted to the largest and stiffest springed pins. The Tucker tack and pin forceps are essential, and the utmost caution is necessary not to become entangled with the pin or to pull upon it.

13. Closure by manipulation with forceps and tube-mouth. This can be accomplished in only a few cases. It is excellent manual practice.

14. Closure by the erecting ring closer. This is adapted to any size of pin, provided a ring of precisely the right size be used.

15. Closure by the Arrowsmith closer. A pin of any size can be closed, provided a closer of proper size be selected of lack of fixity of the pin gives trouble in manikin board practice, the Clerf-Arrowsmith closer should be tried. To close the pin and have the point held by the keeper, it is necessary that the wings of the keeper be not bent in.

16. Seizure by any part seen. Very small pins, whose extreme measurements in every direction do not exceed the diameter of the passages invaded, may thus be seized, though version in such cases would be easy. In cases of large pins, this method is justifiable only in the larynx, hypopharynx, and above this level.

Spasm in the Middle of the Esophagus. Cancer of

the esophagus is often treated by having the patient swallow a radium capsule, or by introducing a radium capsule on a sound with the patient standing before a fluoroscope. This is a bad practice, not only because the approximation of the radium to the lesion is left to chance, but also because the diagnosis should be confirmed by direct vision through an esophagoscope. G. W. Grier[2] thinks that this is well illustrated by the following case:

Mr. A. V., aged 55, presented himself in November, 1923, with a history of increasing difficulty in swallowing for two months, and loss of 60 pounds in weight. He had been drinking heavily for the past month. He had been unable to swallow anything for 4 days, even water being regurgitated during this period. His condition was desperate, and it seemed as if he must succumb in a few days unless relief was obtained. *X*-ray examination with liquid barium meal showed an absolute obstruction at about the middle of the esophagus. Nothing passed this point, and the meal was finally regurgitated. A report of absolute obstruction at the middle of the esophagus was made, probably due either to carcinoma or syphilis. The Wassermann was negative.

He was placed in a hospital for diagnostic esophagoscopy, and while waiting for this was given large doses of belladonna. He was given liquid food, a spoonful or two at a time. At the end of three days, an esophagoscope was passed, and an absolute normal esophagus was found. A second *x*-ray examination made at this time failed to show any obstruction, and the appearance of the esophagus was entirely normal. The patient rapidly recovered his lost weight and was well when last heard from.

This was undoubtedly a case of spasm relieved by large doses of belladonna.

Hysterical Dysphagia. From their experience with

(2) Atlantic M. J., July, 1926.

65 patients presenting this condition H. J. Moersch and H. M. Conner[3] conclude that:

1. There exists a definite group of cases of dysphagia, characterized by secondary anemia and frequently by enlargement of the spleen with no demonstrable lesion in the esophagus, that we have termed hysterical dysphagia.

2. The disease is most predominant among women and is generally of long duration before diagnosis is made.

3. Loss of weight is rather uncommon in spite of restriction of solid foods, especially meats and vegetables.

4. The secondary anemia and enlargement of the spleen probably arise from a prolonged unbalanced diet.

5. Normal deglutition can be restored by passing an esophageal sound, and when this occurs, the blood picture usually returns to normal and the splenic enlargement may subside.

6. Recurrences are likely to occur, but relief can be afforded by further passage of sound and by constant reassurance of the patient.

(3) Arch. Otolaryng., August, 1926.

INDEX

Abducens, otogenic paralysis of the, with especial mention of isolated palsy associated with irritation of the gasserian ganglion, 308

Abscess of the parotid gland following acute membranous tonsillitis, 425; post-tonsillectomic pulmonary, 416; radical cure of peritonsillar, 424

Accommodation and refraction, 41; mechanism of accommodation, 53; total and reserve accommodation in presbyopia, 51

Adenoid growths: hematologic investigations in some infections in the throat and in children with adenoid growths, 438; tonsil and adenoid age, a clinical and preoperative study of the thymus in children of, 409

Adenoma of the tongue, 405

Allergy, rhinologic aspects of, 339

Amblyopia, diabetes and tobacco, 162

Anesthesia, general, in eye, ear, nose and throat surgery, 331

Aneurysm, cerebral, causing ocular symptoms, 160

Angina: acute pemphigus of the throat with positive Vincent's angina, 430; agranulocytic: report of case with fracture of the tibia, 445; therapeutic and prophylactic value of tonsillectomy in active stage of Vincent's, 413

Aniridia in four generations, 106

Anomalies, congenital, of the eye, 9

Aphonia, 485; from goiter, 484

Asthma: bronchoscopic treatment of bronchial asthma and chronic bronchitis with case reports, 489; asthma, hay-fever and other conditions, inefficacy of intravenous calcium injections in, 340

Atmosphere as a factor in the causation of colds, 383

Audiometer in testing the hearing, clinical observations on the use of the, 232

Bacteremia associated with acute hemolytic streptococci throat infections, 435

Bandage, a useful eye, 222

Bifocal operating spectacles, full vision, 223

Blastomycosis of the larynx, 461

Blindness, diagnosis is of, 188; half of blindness is preventable, 197

Blood cells, white, in the treatment of eye infections, 211; hematologic investigations on some infections in the throat and in children with adenoid growths, 438

Bone conduction (see Hearing test); pathologic studies of the temporal bone conduction, 292
Bronchitis, bronchoscopic treatment of bronchial asthma and chronic bronchitis with case reports, 489
Bronchopulmonary lesions, lipiodol in diagnosis of, by bronchoscopic methods, 494
Bronchoscopy and esophagoscopy, 487; emphysema of the neck and chest (pre-operative), following inhalation of a piece of nut, 493; foreign bodies in the tracheobronchial tree; reports of cases in which bronchoscopy was not done, 493; in bronchial asthma and chronic bronchitis with case reports, 489; lipiodol in diagnosis of bronchopulmonary lesions by the bronchoscopic methods, 494; removal of safety-pins, 495; upper lobe bronchoscope, 491

Calcium intravenously: inefficacy of injections in asthma, hay-fever and allied condition, 340
Cancer: neuritis and labyrinthian carcinomatosis, 297; of the larynx, 453, 457; of the larynx, laryngofissure for, 458; of the larynx and laryngopharynx treated with radium, 459; of the mouth: radon (radium emanation) as a palliative agent in treatment of intra-oral cancer, 401; of the mouth: the results of treatment by operation, 400; of the nose and accessory sinuses; combined operative and irradiation treatment of, 374; of the tongue; treatment of, 403
Carcinomatosis, neuritis and labyrinthian, 297
Cataract: danger of infection following cataract operations when the eyeball is opened, 125; intracapsular extraction of immature, 123; intracapsular extraction of, by Barraquer method, 117; lens-antigen treatment of, with consideration of some special features, 132; operations: delirium following, 127; preventive treatment of, 142
Catarrh, etiology of secretory, particularly with nasopharyngeal tumors, 255
Cervical fistulae, lateral, 345
Children: hematologic investigations on some infections in the throat and in children with adenoid growths, 438; paranasal sinus as a focus of infection in children, 358; prognosis of middle-ear suppuration in, 256; spasm of the glottis in adults and children, 470
Cholesteatoma of the middle ear; its etiology, pathogenesis, diagnosis and therapy, 258
Choroid, the, 144; melanosarcoma of the, with extention to the orbit, 146
Choroiditis, black-spot, 147
Cocain poisoning, experimental study of acute; its prophylaxis and treatments, 344
Colds, abortive treatment of, and use of vaccines, 384; atmospheric factor in the causation of, 383
Color acuity: its importance in early diagnosis of disease of the conducting paths and centers and diseases of the neuro-epithelium, 35; color sense, a device for testing the, 221
Congenital anomalies of the eye, 9
Conjunctiva, the, 76
Conjunctivitis; conjunctivitis

tularensis, 84; corneal complications, 81; symptoms and prognosis of, 76; treatment of, 81
Copper sulphate, cure of noma with, 406
Cord, mechanics of vocal cord vibration and of snoring, 479
Cornea: a corneal shield, 226; blood-staining of the, 99; new method (suction) for the removal of foreign bodies on the, 219; treatment of ulcers of the, with the electrothermophore, 103; ulcers of the, 100
Corneoconjunctiva, dermoid tumor of the, 104
Coryza, atrophic, not ozena, due to a possible degeneration of the sphenopalatine ganglion, 386
Cysts in the floor of the mouth, 395.

Deafmutism, contribution to the pathologic anatomy and pathogenesis of, 293
Deafness: chronic nonsuppurative middle-ear deafness (excluding otosclerosis), 258; hereditary syphilitic deafness complicated with bilateral middle-ear suppuration and mastoiditis, 263; is a differential diagnosis between middle and internal ear deafness possible? 307; occurrence of otosclerosis in the etiology of progressive deafness, 300; rôle of irradiation in focal infections and obstructive deafness, 293
Deformity, correction of nasal, 350
Diabetes and tobacco amblyopia, 162
Diphtheria: postdiphtheritic stenosis of the larynx, 472
Disks, choked, 324; surgical significance of a chocked, 157
Douche, simple nasal suction, 388
Dysphagia, hysterical, 499

Ear, the, 231; bacteriology of otogenic meningitis, 281; cisterna drainage in therapy of otogenic meningitis, 283; curability of septic purulent meningitis of otitic origin, 282; general anesthesia in surgery of the ear, 331; otologic complications of basal skull fractures, 317; ototuberculosis, contribution to histology of, 295; paralysis of the abducens, with especial mention of isolated palsy associated with irritation of the gasserian ganglion, 308; pathology and surgery of the eustachian tube, 320; presentation of microscopical sections of various pathological conditions of ear, 289; septicemia of otitic origin, 284; toothache of otitic orgin, 326; treatment of aural disease, 326; vaccine in treatment of affections of the, 265
Ear, external, 246; anatomy, psychology, diagnosis and treatment of congenital malformation and absence of the ear, 247; congenital atresia of external auditory meatus, 246; myringitis bullosa, 252; otomycosis, 248
Ear, internal, 295; is a differential diagnosis between middle and internal ear deafness possible? 307; labyrinth involvement in trauma of the head, 295; neuritis and labyrinthian carcinomatosis, 297
Ear, middle, 252; acute otitis media with mastoiditis, 266; acute suppurative otitis media causing septic arthritis without observable symptoms of intervening mastoiditis or

of involvement of the lateral sinus, 254; as a source of chronic septic absorption, 257; bacteriology of middle-ear disease, 252; cholesteatoma of the middle ear; its etiology, pathogenesis, diagnosis and therapy, 258; chronic nonsuppurative middle-ear deafness (excluding otosclerosis), 258; differential diagnosis in operative and nonoperative purulent otitis media chronic, 261; etiology of secretory catarrh, particularly with nasopharyngeal tumors, 255; hereditary syphilitic deafness complicated with bilateral middle-ear suppuration and mastoiditis, 263; is a differential diagnosis between middle and internal ear deafness possible? 307; mastoiditis without apparent otitis media, 271; problem of the acute ear, 253; prognosis of middle-ear suppuration in children, 256; six cases of definite mastoiditis in which the middle ear was definitely not affected, 268; successful treatment of chronic discharging ears and allied conditions by means of zinc ionization, 264

Electro-thermophore, treatment of ulcers of the cornea with, 103

Emphysema of the neck and chest (pre-operative) following inhalations of a piece of nut, 493

Epistaxis, carotid, ligation in, 394

Epithelium in sinusitis, rôle of ciliated, 380

Esophagoscopy and bronchoscopy, 487; and tracheobronchoscopy, problem of, 488

Esophagus, spasm in the middle of the, 498

Ethmoid cells, intranasal and external methods of operating on the, 365

Eustachian tube, pathology and surgery of the, 320

Exophthalmos a complication of nasal sinusitis, 368

Eye, the, 7; (see also Ophthalmology); a useful bandage for the, 222; accommodation and refraction, 41; mechanism of accommodation, 53; accommodation: total and reserve in presbyopia, 51; congenital anomalies of the, 9; diseases, diagnosis of, 25; examination of the eye; a new test for light sense, 24; examination of the, 12 (see also Ophthalmoscopy); examination: medical ophthalmoscopy, 15; examination: slit-lamp microscopy in every day practice, 20; general anesthesia in surgery of the eye, 331; injuries and foreign bodies in the eye, 181; injuries to the eye, as related to the industrial surgeon, 181; injuries to the eye, early treatment of, 186; internist and the eye, 25; movements of the eye: tonic spasm of the eyes in conjugate deviation, 70; ocular malformation in a woman and her daughter, 11; ossification of the eye, 188; therapeutic action of ultraviolet light upon the eye, 199; value of a field of vision in diagnosis of diseases of the, 37; value of routine examinations of the, in a general diagnostic clinic, 12; white blood cells in treatment of eye infections, 211

Face, plastic surgery of the; new procedures, 353

Facial paralysis, surgical treatment of, 310

Fistulae, lateral cervical, 345

Forceps for positive fixation of the globe, 220
Foreign bodies and injuries in the eye, 181; bronchoscopic removal of safety-pins, 495; emphysema of the neck and chest (pre-operative) following inhalations of a piece of nut, 493; in air and food passages; with special reference to those not casting *x*-ray shadows, 487; in tracheobronchial tree; report of cases in which bronchoscopy was not done, 493; on the cornea, a new method for removal of, 219; phantom foreign body of the larynx, 466

Galvanocautery in treatment of laryngeal tuberculosis, 453
Ganglion, atrophic coryza not ozena, due to a possible degeneration of the sphenopalatine, 386; nasal ganglion (sphenopalatine), 243; otogenic paralysis of the abducens, with especial mention of isolated palsy associated with irritation of the gasserian ganglion, 308
Gargles, gum versus, in post-tonsillectomy treatment, 426
Glasses: full vision bifocal operating spectacles, 223; telescopic spectacles and magnifiers, 54
Glaucoma, history of, 167; responsibility of the general practitioner in the diagnosis of, 169
Glioma and pseudoglioma, slit-lamp in diagnosis of, 36
Globus hystericus frequently a sexual neurosis, 469
Glottis, spasm of the, in adults and children, 470
Goiter, aphonia from, 484
Graft, a method of nasal plastic repair by cartilage, 348
Gum versus gargles in post-tonsillectomy treatment, 426

Harelip and cleft palate, 398
Hay-fever: permanency of hay-fever cures, 337; spring hay-fever: its causes and preventive treatment, 336
Head, labyrinth involvement in trauma of the, 295
Headaches and intranasal surgery, 369
Hearing: investigation of the end-results of 60 cases of radical mastoid operation with special reference to hearing, 288; touch as substitute for hearing in the interpretation and control of speech, 325
Hearing tests: clinical observations on the use of the audiometer in testing the hearing, 232; clinical value and diagnostic significance of the newer tests, 231; fundamentals of bone conduction, 237; problem of middle-ear mechanics; binaural acuity for air and bone transmitted sound under varying conditions in the external auditory canal, 232
Heart: suppuration of the nasal accessory sinuses as a portal of entry of infection in diseases of the heart: 376
Hemorrhagic cysts of the neck, 347

Instruments, new, in ophthalmology, 218
Iodin injections, intravenous, in ophthalmology, 210
Iridocyclitis, atropin and epinephrin in, 113
Iris, the, 106
Irrigation of nasal sinuses, displacement, 382

Keratosis pharyngis, pathology of, 440

Labyrinth: ablation experiments on the labyrinth of frogs, 299; involvement in

trauma of the head, 295; neuritis and labyrinthian carcinomatosis, 297
Lacrimal apparatus, the, 96; epithelioma of lacrimal sac, 96; gland, anomalous duct of lacrimal, 9
Laryngologist, relationship of the, to the public speaker and singer, 475
Larynx, blastomycosis of, 461; cancer of the larynx, 453, 457; carcinoma of the larynx and laryngopharynx treated with radium, 459; chronic laryngo-tracheal stenosis; treatment, 466; contribution to the technic of endoscopic removal of larger tumors of the trachea and larynx, 469; diseases of the, 446; endothelioma of the, 464; galvanocautery in treatment of laryngeal tuberculosis, 453; Goerz-Wessely lamp in the treatment of laryngeal tuberculosis, 449; laryngofissure for cancer of the larynx, 458; phantom foreign body of the, 466; posdiphtheritic stenosis of the, 472; tuberculosis of, 451; *x*-ray examination, newer methods of, of the paranasal sinuses, the optic canals, the pharynx and larynx, 364
Lens, the crystalline, 117; hereditary dislocation of, 143
Leukemia: changes in the nose and nasal accessory cavities in myeloid leukemia, 378
Light treatment, result of, on phlyctenular and other tuberculous lesions of the eye, 209
Lipiodol in diagnosis of bronchopulmonary lesions by the bronchoscopic methods, 494
Lipoma of the pharynx, 444

Malformation, ocular, in a woman and her daughter, 11
Mastoid: indications for mastoid operation, 273; investigation of the end-results of 60 cases of radical mastoid operation, with special reference to hearing, 288; modified radical mastoid operation in the treatment of subacute mastoiditis, 284; radical surgery of the mastoid; end-results, 274; roentgen-ray picture of the mastoid and its clinical interpretation, 267; skin-periosteal flap for the radical mastoid, 286
Mastoiditis, acute otitis media with, 266; acute mastoiditis with lateral sinus thrombosis and pyemia, 275; acute: report of three cases of primary, 26; atypical: report of three cases with operation, 269; hereditary syphilitic deafness complicated with bilateral middle-ear suppuration and mastoiditis, 263; mastoiditis and complications, 266, 277; mastoiditis without apparent otitis media, 271; modified radical mastoid operation in the treatment of subacute mastoiditis, 284; six cases of definite, in which the middle ear was definitely not affected, 268
Meningitis, bacteriology of otogenic, 281; cisterna drainage in therapy of otogenic, 283; of otitic origin, curability of septic purulent, 282
Menstrual disturbances, bilateral optic neuritis from, 161
Microscopy, slit-lamp, in everyday practice, 20
Miosis, prolonged, for control of increased intraocular tension, with remarks on the preparation of solutions of the miotics, 174
Misconduct as a by-product in a speech clinic case, 479
Mouth, cancer of the; results

of treatment by operation and radiation, 400; cancer of mouth: radon (radium emanation) as a palliative agent in treatment of intra-oral cancer, 401; cysts in the floor of the, 395; diseases of the, 395
Myopia and its treatment, 44; high myopia as a degenerative process, 48
Myringitis bullosa, etiology of, 252

Neck, hemorrhagic cysts of the, 347; emphysema of the neck and chest (pre-operative) following inhalations of a piece of nut, 493
Neuritis, anatomically irregular sphenoidal sinusitis with optic, 151; and labyrinthian carcinomatosis, 297; bilateral optic neuritis from menstrual disturbance, 161
Neurosis, globus hystericus, frequently a sexual, 469
Nodes of singers and voice disturbances, 477
Noma, cure of, with copper sulphate, 406
Nose, the, 331; bacterial flora of nose and throat in health and upper respiratory infection, 391; changes in the nose and nasal accessory cavities in myeloid leukemia, 378; deformity, 348, 350; ligation in epistaxis, 394; nasal ganglion (sphenopalatine), 243; nasal passages in lobar pneumonia; a clinical and bacteriological study, 393; simple nasal suction douche, 388; tuberculoma of the middle nasal meatus, 390
Nose, sinuses of the; accessory, 358; combined operative irradiation treatment of cancer of the nose and accessory sinuses, 374; displacement irrigation of nasal sinuses, 382; exophthalmos, a complication of nasal sinusitis, 368; investigations on the development of the sphenoidal sinus, 372; optic neuropathy and sphenoethmoid disease, 367; paranasal sinus as focus of infection in children, 358; radium and *x*-rays in treatment of malignant diseases of the paranasal sinuses, 373; rôle of ciliated epithelium in sinusitis, 380; suppuration of the nasal accessory sinuses as a portal of entry of infection in diseases of the heart, 376; *x*-ray examination, newer methods of, of paranasal sinuses, the optic canals, the pharynx and larynx, 364
Nose, surgery of the nose; general anesthesia in surgery of the nose, 331; headaches and intranasal surgery, 369; intranasal and external methods of operating on the ethomoid cells: a critical consideration, 365; plastic repair by cartilage graft, a method, 348; plastic surgery, use of gold-wire splints in, 354
Nystagmus, 72; nystagmus, nature of, 299

Ocular malformation in a woman and her daughter, 11; muscles, the external, 58; phenomena produced by temporal lobe tumors, 153; radium in therapeutics, 208; symptoms, cerebral aneurysm causing, 160; tension: prolonged miosis for control of increased intra-ocular tension with remarks on the preparation of solutions of the miotics, 174; therapeutics, 199; tuberculosis, 179
Ophthalmia, sympathetic, 149
Ophthalmology, emergency, 212; intravenous iodin in-

jections in, 210; recent advances in, 7
Ophthalmoscopy, medical, 15
Optic canals: *x*-ray examination, newer methods of, of the paranasal sinuses, the optic canals, the pharynx and larynx, 364; nerve, 151; neuritis, anatomically irregular sphenoidal sinusitis with, 151; neuropathy and sphenoethmoid disease, 367
Orbit, inflammatory pseudotumor of, 166; melanosarcoma of the choroid, with extention to the, 146
Otitis media: (see Ear, middle)
Otolaryngology, significance of hyperthyroidism, 334
Otomycosis, 248
Otorhinolaryngology, concerning the free transplantation of bone, cartilage, and fat in, 356
Otosclerosis, 305; occurrence of, in etiology of progressive deafness, 300
Ozena, atrophic coryza not, due to a possible degeneration of the sphenopalatine ganglion, 386; pathogenesis of ozena, 387

Palate, cleft, and harelip, 398; function of the soft palate in singing, 477
Palsy, mechanism of speech and deglutition in progressive bulbar, 483
Paracusis, 321
Paralysis, surgical treatment of facial, 310
Parotid gland, abscess of the, following acute membranous tonsillitis, 425
Pemphigus, acute, of the throat, with positive Vinvent's angina, 430; as a beginning tonsillar manifestation, 429
Pharynx, the, 433; aberrant pulsating vessels in the pharyngeal walls, 440; effect of short wave roentgen and gamma rays on naso-pharyngeal lymphoid tissue, 433; lipoma of the, 444; pathology of keratosis pharyngis, 440; surgery of malignant disease of the pharynx, 441; *x*-ray examination, newer methods, of the paranasal sinuses, the optic canals, the pharynx and larynx, 364
Phonation: method for studying the action of the vocal muscles during phonation with some experimental results and conclusions, 473
Plastic surgery; a method of nasal repair by cartilage graft, 348; of face and neck, newer procedures and methods in, 353; use of gold-wire splints, 354
Pneumonia, nasal passages in lobar; a clinical and bacteriological study, 393
Presbyopia, total and reserve accommodation in, 51
Pupillary changes, significance of certain pathological, 107
Pyemia, acute mastoiditis, lateral sinus thrombosis and, 275

Radium: combined operative and irradiation treatment of cancer of the nose and accessory sinuses, 374; emanations (radon) as a palliative agent in treatment of intraoral cancer, 401; in ocular therapy, 208; treatment of carcinoma of the larynx and laryngopharynx, 459; *x*-rays and radium in the treatment of malignant diseases of the paranasal sinuses, 373
Radon (radium emanation) as a palliative agent in treatment of intraoral cancer, 401
Recumbent, reading and writing for the, 224
Refraction and accommodation,

41; use of cross cylinders in, 41
Retina, the, 144; vascular legions of the, in young persons, 145
Retinalis, diabetic lipemia, and fat embolism, 144
Retinitis, relationship of tuberculosis to certain fundus changes especially periphlebitic, 179
Retino-choroiditis juxta-papillaris, 148
Rhinology: rhinologic aspects of allergy, 339
Roentgen-ray: combined operative and irradiation treatment of cancer of the nose and accessory sinuses, 374; examinations, newer methods of, of the paranasal sinuses, the optic canals, the pharynx and larynx, 364; foreign bodies in air and food passages with special reference to those not casting *x*-ray shadows, 487; gamma and roentgen-rays, effect of short wave, on naso-pharyngeal lymphoid tissue, 433; picture of the mastoid and its clinical interpretation, 267; radium in the treatment of malignant diseases of the paranasal sinuses, 373

Salivary tumor, mixed, in the tonsillar region, 423
Septicemia of otitic origin, 284
Septum, etiology of deviated, 385
Singer: function of the soft palate in singing, 477; nodes and voice disturbances of singers 477; relationship of the laryngologist to the public speaker and singer, 475
Sinuses, nasal: acute mastoiditis, lateral sinus thrombosis and pyemia, 275; displacement irrigation of nasal sinuses, 382; paranasal, as a focus of infection in children, 358; paranasal: *x*-ray examination, newer methods of, of paranasal sinuses, the optic canals, the pharynx and larynx, 364; rôle of ciliated epithelium in sinusitis, 380
Sinusitis, anatomically irregular sphenoidal, with optic neuritis, 151; exophthalmos, a complication of nasal, 368; hyperplastic maxillary, 361
Skin-periosteal flap for the radical mastoid, 286
Skull fracture, otologic complications of basal, 317
Slit-lamp in diagnosis of glioma and pseudoglioma, 36; breath screen for, 218; microscopy in every day practice, 20
Snoring, mechanics of vocal cord vibration and of, 479
Speech and voice disorders, 473; deglutition, mechanism of, in progressive bulbar palsy, 483; disorders of, 482; misconduct as a by-product in speech clinic case, 479; touch as substitute for hearing in the interpretation and control of speech, 325; use of gold-wire, in intranasal plastic surgery, 354
Squint, (see Strabismus)
Stenosis, chronic, of laryngotracheal; treatment, 466; of the larynx, postdiphtheritic, 472
Strabismus: a family of squinters, 58; divergent, 64; reason for early treatment of, 59
Streptococcus: bactermia associated with acute hemolytic streptococci throat infections, 435

Therapeutic action of ultraviolet light upon the eye, 199; radium in ocular, 208
Throat, bacterial flora of nose and throat in health and up-

per respiratory infection, 391; bacteremia associated with acute hemolytic streptococci throat infections, 435; diseases of the, 407; general anesthesia in surgery of the throat, 331; hematologic investigations on some infections of the throat and in children with adenoid growths, 438; pemphigus of the throat, 431; acute pemphigus of the throat with positive Vincent's angina, 430

Thymus, a clinical and preoperative study of the, in children of the tonsil and adenoid age, 409

Thyroid: hyperthyroidism; its significance in otolgaryngology, 334

Tibia, report of a case of agranulocytic angina with fracture of the, 445

Tobacco amblycpia, diabetes and, 162

Tongue, adenoma of the, 405; carcinoma of the, treatment of, 403

Tonsil and adenoid age, a clinical and preoperative study of the thymus in children of, 409; mixed salivary tumor in the tonsillar region, 423; operation, results of, 422; pemphigus as a beginning tonsillar manifestation, 429; radical cure of peritonsillar abscess, 424; what is wrong with the tonsil operation? 407

Tonsillectomy: by propulsion and avulsion, 412; convenient pillar retractor, 429; end-results of tonsillectomies and adenoidectomies, 416, 418; gum versus gargles in post-tonsillectomy treatment, 426; in active stage of Vincent's angina, therapeutic and prophylactic value of, 413; post-tonsillectomic pulmonary abscess, 413

Tonsillitis, abscess of the parotid gland following acute membranous, 425; chronic, at various ages, 408; pathologico-anatomic findings in clinical lacunar, 408

Tonsillomycoses, 428

Toothache of otitic origin, 326

Trachea: contribution to the technic of endoscopic removal of larger tumors of the trachea and larynx, 469; diseases of the, 446; spontaneous subcutaneous rupture of the, 467

Tracheobronchoscopy and esophagoscopy, problem of, 488

Trachoma, surgery of, 85

Tuberculoma of the middle nasal meatus, 390

Tuberculosis, laryngeal, 466; laryngeal: galvanocautery in treatment of, 453; laryngeal: Goerz-Wessely lamp in laryngeal tuberculosis, 449; laryngeal, treatment of, 451; of the eye: result of treatment by artificial light on phlyctenular and other tuberculosis lesions of the eye, 209; relationship of tuberculosis to certain fundus changes, especially periphlebitic retinitis, 179; ototuberculosis: contribution to histology of, 295

Tularensis, conjunctivitis, 84

Tumor: contribution to the technic of endoscopic removal of larger tumors of the trachea and larynx, 469; endothelioma of the larynx, 461; etiology of secretory catarrh, particularly with nasopharyngeal tumors, 255; inflammatory pseudo-tumor of the orbit, 166; mixed salivary, in the tonsillar region, 423; of the temporal lobe

producing ocular phenomena, 153; slit-lamp in diagnosis of glioma and pseudoglioma, 36

Ulcers of the cornea, 100; treatment of, with the electrothermophore, 103
Ultraviolet light upon the eye, therapeutic action of, 199
Uviol light, 205

Vaccines and abortive treatment in colds, 384; treatment of affections of the ear, 265
Vision, value of a field of, in diagnosis of eye disease, 37
Voice and speech disorders, 473; method for studying the action of the vocal muscles during phonation with some experimental results and conclusions, 473; singers nodes and voice disturbances, 477

Zinc ionization, successful treatment of chronic discharging ears and allied conditions by means of, 264

INDEX OF AUTHORS

Adson, A. W., 227, 310
Alexander, John, 225
Almour, R., 267
Anthon, 440
Anthony, D. H., 416
Ashby, C. F., 11

Baer, B. F., 175
Bagley, C. H., 123
Baker, M. C., 101
Ballenger, H. C., 435
Ballon, D. H., 494
Bantin, C. F., 144
Barkas, Mary R., 70
Barlow, R. A., 266, 432
Barwell, H., 470
Bass, A. L., 81
Batten, R. D., 147
Baum, H. L., 424
Beck, J. C., 247
Bell, George H., 125
Benedict, W. L., 16
Berlin, J. I., 408
Black, Melville, 212
Blanton, Smiley, 482
Bolognesi, G., 405
Borsch, 142
Bourack, S., 356
Bowman, N. H., 37
Bridgett, F. A., 289
Brown, M. Earle, 35
Brunner, H., 295
Buckman, E. U., 327
Butler, Harrison, 37
Byers, W. G. M., 44

Cabaniss, W. H., 167
Cameron, E. P., 143
Carter, W. W., 350, 355
Castellani, A., 428
Casteran, 326
Chisholm, J. J., 248
Clerf, L. H., 493
Clock, R. O., 336
Coates, G. M., 339
Conner, H. M., 500
Conway, J. A., 160
Critchley, Macdonald, 483
Cutler, E. C., 157

Dabney, S. G., 161, 273
Daily, Ray K., 55
Davis, A. E., 133
Dean, Walter, 77
DeGentile, 208
Demetriades, T. D., 298
Denman, I. O., 293

De River, J. P., 489
Deutsch, L. 246
Dintenfass, H., 429
Dochez, A. R., 391
Dodd, L. E., 473
Downey, J. W., 243
Drury, D. W., 305
Dunphy, Edwin B., 72
Dupuy, H., 440
Dykman, A. B., 105

Egan, B. W., 64
Elder, W. S. D., 199

Felty, A. R., 393
Fenton, R. A., 97
Fewell, A. G., 164
Fischer, J., 292
Flesher, R. E., 401
Forbes, H. H., 493
Fowler, E. P., 231, 237
Freedman, A. O., 423
Fremont-Smith, M., 25
Friedenwald, H., 145

Gault, R. H., 325
Georke, M., 283
Gifford, S. R., 205
Goalwin, H. A., 364
Gomperz, R., 469
Gradenigo, G., 387
Greenbaum, S. S., 429
Greenfield, S. D., 275
Grier, G. W., 499
Grossman, B., 408
Guthrie, D., 256

Haines, C. E., 429
Hall, G. C., 81
Halsted, T. H., 320
Hanger, F. M., 391
Hansel, F. K., 271
Harris, T. J., 418
Harrison, W. G., 149
Hasty, F. E., 284
Hays, H., 232
Heatley, C. A., 393
Hemeleers, H. M., 265
Hempstead, B. E., 268
Hepburn, 149
Herriman, F. R., 444
Hill, F. T., 407

Hirsch, O., 385
Holderman, J. W., 300
Holloway, T. B., 180
Hopkins, G. H., 107
Horgan, J. B., 412
Hume, Graydon, 24
Hunter, R. J., 445
Hurst, V. R., 41

Iglauer, S., 466
Imperatori, C. J., 460
Israel, Sidney, 219

Jackson, C., 413, 461, 495
Jackson, Edward, 188
Jackson, Sach W., 84
Jones, C. C., 446
Jones, I. H., 321
Jowett, R. E., 277
Jura, 347

Kaspar, 406
Keen, J. A., 288
Kiehle, F. A., 254
Klestadt, W., 374
Knudsen, V. O., 321
Kopetzky, S. J., 267
Kramer, R., 345
Kranz, F. W., 232, 307
Kubik, Charley S., 483

Ladd, W. E., 398
Large, S. H., 475
Lewis, E. R., 299
Lewis, J. Brook, 106
Lewis, Park, 197
Lijó Pavía, J., 188
Lillie, H. I., 324, 369
Lillie, Walter I., 153
Ling, W. P., 9
Lobell, A., 425
Long, W. H., 331

MacGruer, H. A., 430
MacKenty, J. E., 453
Mackenzie, G. W., 263
Macmillan, A. S., 409
Maghy, Charles, 100
Maloens, 282
Martenstein, H., 375
Matsui, T., 488
McCoy, H. J., 48

McCoy, J. C., 265
McDougall, C., 464
McKnight, H., 394
McLoone, J. J., 270
McReynolds, J. O., 169
Metzenbaum, Myron, 223
Metzger, 210
Meyer, M. F., 12
Miller, C. M., 367
Miller, J. C., 449
Milligan, W., 258
Mills, 391
Mitchell, E. C., 358
Mithoefer, W., 361
Moersch, H. J., 500
Moore, R. S., 451
Mosher, H. P., 409
Motley, F. E., 409
Munby, W. M., 277
Myers, E. L., 487
Myerson, M. C., 466, 491

Nager, F. R., 258
Nelson, W. G., 221
Nemzek, W., 232
Neumann, H., 281
New, G. B., 353
Nixon, J. W., 467
Nutt, A. B., 209

Obarrio, P., 53
Odeneal, T. H., 284
Oppikofer, 295
Orton, H. B., 472

Patton, J. M., 220
Peter, Luther C., 21
Phillips, F. L., 380
Phinney, F. D., 104
Pohlman, A. G., 307
Potts, J. B., 469
Pratt, F. J., 422
Proetz, A. W., 382

Quick, D., 373, 403

Rabotnoff, L. D., 477
Ranson, J. R., 433
Reese, A. B., 222
Reid, H. W., 7
de Reynier, L., 453
Rodger, T. R., 253
Rodin, F. H., 58, 113
Rubenstein, A. H., 430
Ruttin, 255

Sabine, W. C., 232
Scheppegrel, W., 338
Schmidt, V., 438
Schnaudigel, 210
Schroeder, A. A., 227
Schweinitz, G. E. de, 164, 175
Sears, W. H., 308
Seydell, E. M., 274
Shekter, A. T., 388
Shibley, G. S., 391
Shuman, J. W., 484
Simmons, C. S., 400
Simpson, F. E., 401
Skillern, R. H., 365
Slataper, F. J., 52
Smyth, D. C., 286
Sokolowski, 477
Souchet, I. A., 386
Spencer, W. H., 427
Sperry, F. N., 384
Spielberg, W., 376
Stein, O. J., 395
Sternberg, H., 379
Steurer, 267
Steurer, O., 294
Stieren, Edward, 146
Stockard, Cecil, 218
Sutton, A. C., 248

Tait, J., 299
Tatum, A. L., 344
Thomas, F. C., 127
Thommen, A. A., 340
Thomson, St. Clair, 457
Tonndorf, W., 390, 479
Trotter, W., 441
Tucker, G., 458

Ullmann, E. V., 252

van Gilse, P. H. G., 372

Walapfel, R., 408
Walker, Jr., Sydney, 181
Walthall, T. J., 261
Watson, W. R., 485
Watson-Williams, E., 257, 348
Watson-Williams, P., 151

Waugh, J. M., 334
Wells, W. A., 383
Westlake, S. B., 413
Weymann, M. F., 59
Wilkerson, W. W., 186
Williamson-Noble, F. A., 166
Wirth, E., 252
Withers, S., 433
Wolfe, Otis, 119

Yates, A. L., 380
Yerger, C. F., 317, 368
Young, Herman H., 479

Ziegler, S. L., 85
Zorab, Arthur, 211